

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

2000-01 ENGINES

Engine Mechanical - 4.3L Unit Repair (Overhaul)

SPECIFICATIONS

IMPORTANT: This article provides "out of the vehicle" Overhaul information, supplementing the Engine Mechanical article.

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Accelerator Control Cable Bracket Nut	12 N·m	106 lb in
Accelerator Control Cable Bracket Stud to Intake Manifold	6 N·m	53 lb in
Accelerator Control Cable Bracket Stud to Throttle Body	12 N·m	106 lb in
Air Cleaner Adapter Stud	8 N·m	71 lb in
Air Conditioning (A/C) Compressor Side Brace Bolt	25 N·m	18 lb ft
Air Conditioning (A/C) Hose Bracket Nut to Intake Manifold	5 N·m	44 lb in
Air Conditioning (A/C) Pipe Bracket Nut to Rear of Left Cylinder Head	35 N·m	26 lb ft
Balance Shaft Driven Gear Bolt		
First Pass	20 N·m	15 lb ft
Final Pass	35 degrees	
Balance Shaft Retainer Bolt	12 N·m	106 lb in
Belt Idler Pulley Bolt	50 N·m	37 lb ft
Body Bolt		
First Pass in Sequence – All Bolts	35 N·m	26 lb ft
Final Pass in Sequence – Center Bolts	155 N·m	114 lb ft
Final Pass in Sequence – Front and Rear Bolts	90 N·m	66 lb ft
Camshaft Retainer Bolt	12 N·m	106 lb in
Camshaft Sprocket Bolt	25 N·m	18 lb ft
Connecting Rod Nut		
First Pass	27 N·m	20 lb ft
Final Pass	70 degrees	
Crankshaft Balancer Bolt	95 N·m	70 lb ft
Crankshaft Bearing Cap Bolt – Preferred Method		
First Pass	20 N·m	15 lb ft
Final Pass	73 degrees	
Crankshaft Bearing Cap Bolt – Optional Strategy	105 N·m	77 lb ft
Crankshaft Position Sensor Bolt	9 N·m	80 lb in
Crankshaft Pulley Bolt	58 N·m	43 lb ft
Crankshaft Rear Oil Seal Housing Bolt and Nut	12 N·m	106 lb in
Crankshaft Rear Oil Seal Housing Retainer Stud	6 N·m	53 lb in

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Fig. 1: Fastener Tightening Specifications (1 Of 4)
Courtesy of GENERAL MOTORS CORP.

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Application	Specification	
	Metric	English
Cylinder Head Bolt – Preferred Method		
All Bolts First Pass in Sequence	30 N·m	22 lb ft
Long Bolts Final Pass in Sequence	75 degrees	
Medium Bolts Final Pass in Sequence	65 degrees	
Short Bolts Final Pass in Sequence	55 degrees	
Cylinder Head Bolt – Optional On-Vehicle Strategy		
First Pass in Sequence	35 N·m	26 lb ft
Second Pass in Sequence	60 N·m	44 lb ft
Final Pass in Sequence	90 N·m	66 lb ft
Cylinder Head Core Hole Plug	20 N·m	15 lb ft
Distributor Cap Bolt	2.4 N·m	21 lb in
Distributor Clamp Bolt	25 N·m	18 lb ft
Drive Belt Tensioner Bolt	50 N·m	37 lb ft
EGR Valve Bolt		
First Pass	7 N·m	62 lb in
Final Pass	30 N·m	22 lb ft
EGR Valve Inlet Pipe Clamp Bolt	25 N·m	18 lb ft
EGR Valve Inlet Pipe Nut at Exhaust Manifold	30 N·m	22 lb ft
EGR Valve Inlet Pipe Nut at Intake Manifold	25 N·m	18 lb ft
Engine Block Coolant Drain Hole Plug	20 N·m	15 lb ft
Engine Block Left Rear Oil Gallery Plug	30 N·m	22 lb ft
Engine Block Left Side Oil Gallery Plug	20 N·m	15 lb ft
Engine Block Oil Gallery Plug	20 N·m	15 lb ft
Engine Block Right Rear Oil Gallery Plug	20 N·m	15 lb ft
Engine Coolant Heater Bolt/Screw	2 N·m	18 lb in
Engine Coolant Temperature (ECT) Sensor	20 N·m	15 lb ft
Engine Flywheel Bolt	100 N·m	74 lb ft
Engine Front Cover Bolt	12 N·m	106 lb in
Engine Lift Front Bracket Stud	35 N·m	26 lb ft
Engine Mount Bolt to Frame (4WD)	59 N·m	44 lb ft
Engine Mount Bolt to Frame (RWD)	47 N·m	35 lb ft
Engine Mount Bracket Bolt to Engine	64 N·m	47 lb ft
Engine Mount Bracket to Frame Bolt (RWD)	47 N·m	35 lb ft
Engine Mount Bracket to Frame Nut (RWD)	42 N·m	31 lb ft
Engine Mount Frame Bracket Through-bolt	68 N·m	50 lb ft
Engine Mount Nut to Frame (RWD)	42 N·m	31 lb ft
Engine Oil Pressure Gage Sensor	30 N·m	22 lb ft
Engine Oil Pressure Gage Sensor Fitting – Plus Required Angle	15 N·m	11 lb ft
Engine Wiring Harness Bracket Bolt to Generator and Drive Belt Tensioner Bracket	25 N·m	18 lb ft
Engine Wiring Harness Bracket Nut to Evaporative Emission (EVAP) Canister Purge Solenoid Valve	8 N·m	71 lb in
Engine Wiring Harness Bracket Nut to Intake Manifold	12 N·m	106 lb in
Engine Wiring Harness Retainer Bolt to Rear of Right Cylinder Head	36 N·m	27 lb ft
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Nut to Intake Manifold	10 N·m	89 lb in
Exhaust Manifold Bolt/Stud		
First Pass	15 N·m	11 lb ft

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Fig. 2: Fastener Tightening Specifications (2 Of 4)
Courtesy of GENERAL MOTORS CORP.

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

Application	Specification	
	Metric	English
Final Pass	30 N·m	22 lb ft
Fan and Water Pump Pulley Bolt	25 N·m	18 lb ft
Fuel Meter Body Bracket Bolt	10 N·m	89 lb in
Fuel Pipe Bracket Bolt	6 N·m	53 lb in
Fuel Pipe Bracket Stud to Rear of Cylinder Head	33 N·m	24 lb ft
Fuel Pipe Retainer Nut	3 N·m	27 lb in
Fuel Supply Pipe Nut – Fuel Tank Side	30 N·m	22 lb ft
Generator and Drive Belt Tensioner Bracket Bolt to Engine	41 N·m	30 lb ft
Generator and Drive Belt Tensioner Bracket Stud Nut	41 N·m	30 lb ft
Generator and Drive Belt Tensioner Bracket Stud to Engine	20 N·m	15 lb ft
Ground Wire Bolt to Rear of Cylinder Head	35 N·m	26 lb ft
Ground Wire Nut to Water Outlet Stud	19 N·m	14 lb ft
Ignition Coil Stud	12 N·m	106 lb in
Knock Sensor	25 N·m	18 lb ft
Lower Intake Manifold Bolt		
First Pass in Sequence	3 N·m	27 lb in
Second Pass in Sequence	12 N·m	106 lb in
Final Pass in Sequence	15 N·m	11 lb ft
Negative Battery Cable Stud	40 N·m	30 lb ft
Oil Cooler Pipe Bracket Bolt to Oil Pan	10 N·m	89 lb in
Oil Fill Tube Bolt	25 N·m	18 lb ft
Oil Filter Adapter Bolt	21 N·m	15 lb ft
Oil Filter Fitting	55 N·m	41 lb ft
Oil Level Indicator Tube Bolt	12 N·m	106 lb in
Oil Level Indicator Tube Bolt to Transmission Fluid Fill Tube	12 N·m	106 lb in
Oil Pan Baffle Bolt	12 N·m	106 lb in
Oil Pan Bolt and Nut	25 N·m	18 lb ft
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pump Bolt to Rear Crankshaft Bearing Cap	90 N·m	66 lb ft
Oil Pump Cover Bolt	12 N·m	106 lb in
Park Brake Bracket Bolt to Frame	24 N·m	18 lb ft
Power Steering Pump Bolt	50 N·m	37 lb ft
Power Steering Pump Bracket Bolt to Engine	41 N·m	30 lb ft
Power Steering Pump Bracket Stud Nut	41 N·m	30 lb ft
Power Steering Pump Bracket Stud to Engine	20 N·m	15 lb ft
Power Steering Pump Rear Bracket Nut to Engine	41 N·m	30 lb ft
Power Steering Pump Rear Bracket Nut to Power Steering Pump	50 N·m	37 lb ft
Spark Plug		
Initial Installation – NEW Cylinder Head	30 N·m	22 lb ft
All Subsequent Installations	15 N·m	11 lb ft
Spark Plug Wire Support Bolt	12 N·m	106 lb in
Starter Motor Wiring Harness/Transmission Cooler Pipe Bracket Bolt to Oil Pan	10 N·m	89 lb in
Throttle Body Stud	9 N·m	80 lb in
Transmission Bolt to Oil Pan	47 N·m	35 lb ft
Transmission Cover Bolt	12 N·m	106 lb in
Transmission Fluid Fill Tube Bolt to Accelerator Control Cable Bracket	6 N·m	53 lb in

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Fig. 3: Fastener Tightening Specifications (3 Of 4)
Courtesy of GENERAL MOTORS CORP.

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

Application	Specification	
	Metric	English
Upper Intake Manifold Stud		
First Pass	5 N·m	44 lb in
Final Pass	9 N·m	80 lb in
Upper Radiator Hose Support Bracket Nut to Exhaust Manifold Stud	36 N·m	27 lb ft
Valve Lifter Pushrod Guide Bolt	16 N·m	12 lb ft
Valve Rocker Arm Bolt	30 N·m	22 lb ft
Water Outlet Stud	25 N·m	18 lb ft
Water Pump Bolt	45 N·m	33 lb ft

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Fig. 4: Fastener Tightening Specifications (4 Of 4)
Courtesy of GENERAL MOTORS CORP.

ENGINE MECHANICAL SPECIFICATIONS

Application	Specification	
	Metric	English
General Data		
Engine Type	V6	
RPO Code	L35/LU3	
VIN Code	W/X	
Displacement	4.3 L	262 CID
Bore	101.60 mm	4.012 in
Stroke	88.39 mm	3.480 in
Compression Ratio	9.2:1	
Firing Order	1-6-5-4-3-2	
Spark Plug Gap	1.52 mm	0.060 in
Oil Pressure – Minimum – at Normal Operating Temperature	42 kPa at 1,000 RPM 125 kPa at 2,000 RPM 166 kPa at 4,000 RPM	6 psig at 1,000 RPM 18 psig at 2,000 RPM 24 psig at 4,000 RPM
Balance Shaft		
Rear Bearing Journal Clearance	0.050–0.088 mm	0.0020–0.0035 in
Rear Bearing Journal Diameter	38.085–38.100 mm	1.4994–1.500 in
Camshaft		
End Play	0.0254–0.2286 mm	0.0010–0.0090 in
Journal Diameter	47.440–47.490 mm	1.8677–1.8696 in
Journal Diameter Out-of-Round	0.025 mm – Maximum	0.0010 in – Maximum
Lobe Lift – Exhaust	7.20–7.30 mm	0.283–0.287 in
Lobe Lift – Intake	6.97–7.07 mm	0.274–0.278 in
Runout	0.065 mm	0.0026 in
Connecting Rod		
Connecting Rod Bearing Clearance – Production	0.038–0.078 mm	0.0015–0.0031 in
Connecting Rod Bearing Clearance – Service	0.025–0.063 mm	0.0010–0.0025 in
Connecting Rod Journal Diameter	57.116–57.148 mm	2.2487–2.2497 in
Connecting Rod Journal Out-of-Round – Production	0.007 mm – Maximum	0.0002 in – Maximum
Connecting Rod Journal Out-of-Round – Service	0.025 mm – Maximum	0.0010 in – Maximum
Connecting Rod Journal Taper – Production	0.00508 mm – Maximum	0.00030 in – Maximum
Connecting Rod Journal Taper – Service	0.025 mm – Maximum	0.0010 in – Maximum
Connecting Rod Side Clearance	0.15–0.44 mm	0.006–0.017 in

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Fig. 5: Engine Mechanical Specifications (1 Of 3)
Courtesy of GENERAL MOTORS CORP.

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

Application	Specification	
	Metric	English
Crankshaft		
Crankshaft Bearing Clearance – Journal #1–Production	0.02–0.508 mm	0.0008–0.0020 in
Crankshaft Bearing Clearance – Journal #2, #3, and #4–Production	0.028–0.058 mm	0.0011–0.0023 in
Crankshaft Bearing Clearance – Journal #1–Service	0.0254–0.05 mm	0.0010–0.0020 in
Crankshaft Bearing Clearance – Journal #2, #3, and #4–Service	0.025–0.063 mm	0.0010–0.0250 in
Crankshaft End Play	0.050–0.20 mm	0.002–0.008 in
Crankshaft Journal Diameter – Journal #1	62.199–62.217 mm	2.4488–2.4495 in
Crankshaft Journal Diameter – Journal #2 and #3	62.191–62.215 mm	2.4485–2.4494 in
Crankshaft Journal Diameter – Journal #4	62.179–62.203 mm	2.4480–2.4489 in
Crankshaft Journal Out-of-Round – Production	0.005 mm – Maximum	0.0002 in – Maximum
Crankshaft Journal Out-of-Round – Service	0.025 mm – Maximum	0.0010 in – Maximum
Crankshaft Journal Taper – Production	0.007 mm – Maximum	0.0003 in – Maximum
Crankshaft Runout	0.025 mm – Maximum	0.0010 in – Maximum
Cylinder Bore		
Diameter	101.618–101.643 mm	4.0007–4.0017 in
Out-of-Round – Production	0.0127 mm – Maximum	0.00050 in – Maximum
Out-of-Round – Service	0.05 mm – Maximum	0.002 in – Maximum
Taper – Production Relief Side	0.025 mm – Maximum	0.0010 in – Maximum
Taper – Production Thrust Side	0.012 mm – Maximum	0.0005 in – Maximum
Taper – Service	0.025 mm – Maximum	0.0010 in – Maximum
Cylinder Head		
Surface Flatness	0.10 mm – Maximum	0.004 in – Maximum
Exhaust Manifold		
Surface Flatness – Flange to Flange	0.25 mm – Maximum	0.010 in – Maximum
Surface Flatness – Individual Flange	0.05 mm – Maximum	0.002 in – Maximum
Intake Manifold		
Surface Flatness	0.10 mm – Maximum	0.004 in – Maximum
Oil Pan		
Oil Pan Alignment at Rear of Engine Block	0.3 mm – Maximum	0.011 in – Maximum
Piston		
Piston Bore Clearance – Production	0.018–0.061 mm	0.0007–0.0024 in
Piston Bore Clearance – Service	0.075 mm – Maximum	0.0029 in – Maximum
Piston Pin		
Clearance in Piston – Production	0.013–0.023 mm	0.0005–0.0009 in
Clearance in Piston – Service	0.025 mm – Maximum	0.0010 in – Maximum
Diameter	23.545–23.548 mm	0.9270–0.9271 in
Fit in Connecting Rod	0.012–0.048 mm – Interference	0.0005–0.0019 in – Interference
Piston Rings – End Gap Measured in Cylinder Bore		
Piston Compression Ring Gap – Production–Top Groove	0.25–0.40 mm	0.010–0.016 in
Piston Compression Ring Gap – Production–2nd Groove	0.38–0.58 mm	0.015–0.023 in
Piston Compression Ring Gap – Service–Top Groove	0.25–0.50 mm	0.010–0.020 in
Piston Compression Ring Gap – Service–2nd Groove	0.38–0.80 mm	0.015–0.031 in
Piston Compression Ring Groove Clearance – Production–Top Groove	0.030–0.070 mm	0.0012–0.0027 in

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Fig. 6: Engine Mechanical Specifications (2 Of 3)
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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

Application	Specification	
	Metric	English
Piston Compression Ring Groove Clearance – Production–2nd Groove	0.040–0.080 mm	0.0015–0.0031 in
Piston Compression Ring Groove Clearance – Service	0.030–0.085 mm	0.0012–0.0033 in
Piston Oil Ring Gap – Production	0.25–0.76 mm	0.010–0.029 in
Piston Oil Ring Gap – Service	0.005–0.090 mm	0.0002–0.0035 in
Piston Oil Ring Groove Clearance – Production	0.046–0.196 mm	0.0018–0.0077 in
Piston Oil Ring Groove Clearance – Service	0.046–0.200 mm	0.0018–0.0079 in
Valve System		
Valve Face Angle	45 degrees	
Valve Head Edge Margin	0.79 mm – Minimum	0.031 in – Minimum
Valve Lash	Net Lash—No Adjustment	
Valve Lift – Exhaust	10.879 mm	0.4280 in
Valve Lift – Intake	10.527 mm	0.4140 in
Valve Lifter	Hydraulic Roller Type	
Valve Rocker Arm	Roller Pivot Type	
Valve Rocker Arm Ratio	1.5:1	
Valve Seat Angle	46 degrees	
Valve Seat Runout	0.05 mm – Maximum	0.002 in – Maximum
Valve Seat Width – Exhaust	1.651–2.489 mm	0.065–0.098 in
Valve Seat Width – Intake	1.016–1.651 mm	0.040–0.065 in
Valve Spring Free Length	51.3 mm	2.02 in
Valve Spring Installed Height – Exhaust	42.92–43.43 mm	1.670–1.700 in
Valve Spring Installed Height – Intake	42.92–43.43 mm	1.670–1.700 in
Valve Spring Pressure – Closed	338–374 N at 43.2 mm	76–84 lb at 1.70 in
Valve Spring Pressure – Open	832–903 N at 32.3 mm	187–203 lb at 1.27 in
Valve Stem Clearance – Exhaust–Production	0.025–0.069 mm	0.0010–0.0027 in
Valve Stem Clearance – Exhaust–Service	0.025–0.094 mm	0.0010–0.0037 in
Valve Stem Clearance – Intake–Production	0.025–0.069 mm	0.0010–0.0027 in
Valve Stem Clearance – Intake–Service	0.025–0.094 mm	0.0010–0.0037 in
Valve Stem Oil Seal Installed Height – Measured from the Top of the Large Diameter Valve Guide Bevel to the Bottom of the Valve Stem Oil Seal	1–2 mm	0.03937–0.07874 in

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Fig. 7: Engine Mechanical Specifications (3 Of 3)
Courtesy of GENERAL MOTORS CORP.

SEALERS, ADHESIVES & LUBRICANTS

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

Application	Type of Material	GM Part Number	
		United States	Canada
Balancer Shaft Driven Gear Bolt	Threadlock	12345382	10953489
Camshaft Retainer Bolt	Threadlock	12345382	10953489
Crankshaft Balancer Keyway	Adhesive	12346141	10953433
Cylinder Head Bolt	Sealant	12346004	10953480
Engine Block to the Crankshaft Rear Oil Seal Housing Junction at the Oil Pan Sealing Surfaces	Adhesive	12346141	10953433
Engine Block to the Engine Front Cover Junction at the Oil Pan Sealing Surfaces	Adhesive	12346141	10953433
Engine Block at the Lower Intake Manifold Sealing Surfaces	Adhesive	12346141	10953433
Engine Block Coolant Drain Hole Plug	Sealant	12346004	10953480
Engine Block Core Hole Plug	Threadlock	12345382	10953489
Engine Block Oil Gallery Plug	Sealant	12346004	10953480
Engine Coolant Temperature (ECT) Gage Sensor	Sealant	12346004	10953480
Engine Coolant Temperature (ECT) Sensor	Sealant	12346004	10953480
Engine Oil	SAE 5W-30 Oil	12345610	993193
Engine Oil Pressure Sensor	Sealant	12346004	10953480
Engine Oil Pressure Sensor Fitting	Sealant	12346004	10953480
Engine Oil Supplement	Lubricant	1052367	992367
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Stud	Threadlock	12345382	10953489
Exhaust Manifold Bolt/Stud	Threadlock	12345493	10953488
Expansion Cup Plug – Balance Shaft Rear Bearing Hole	Sealant	12346004	10953480
Expansion Cup Plug – Camshaft Rear Bearing Hole	Sealant	12346004	10953480
Fuel Meter Body Bracket Bolt	Threadlock	12345382	10953489
Fuel Pipe Bolt	Threadlock	12345382	10953489
Lower Intake Manifold Bolt	Threadlock	12345382	10953489
Oil Level Indicator Tube	Sealant	12346004	10953480
Oil Pump Screen Tube	Sealant	12346004	10953480
Throttle Body Stud	Threadlock	12345382	10953489
Upper Intake Manifold Stud	Threadlock	12345382	10953489
Valve Train Component Prelube	Lubricant	12345501	992704
Water Pump Bolt	Sealant	12346004	10953480

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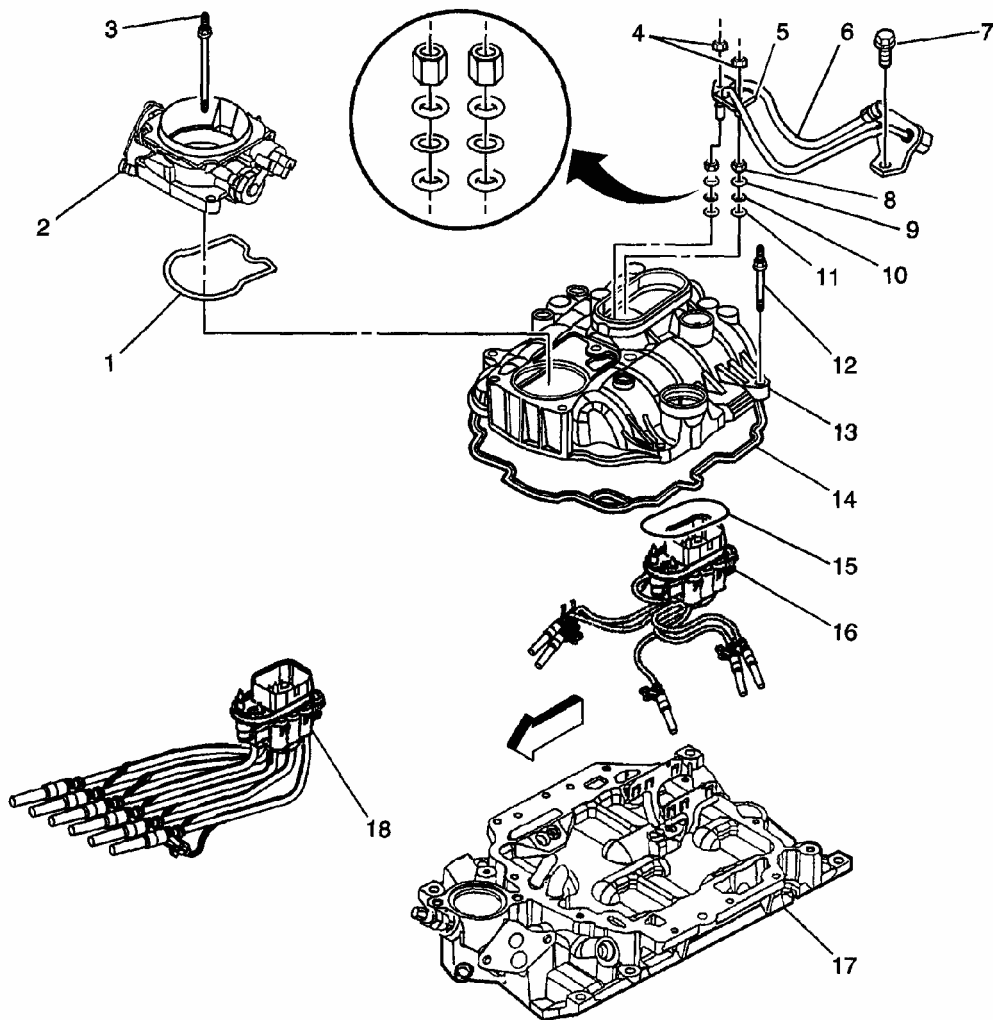
Fig. 8: Sealer, Adhesive & Lubricant Usage
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

DISASSEMBLED VIEWS

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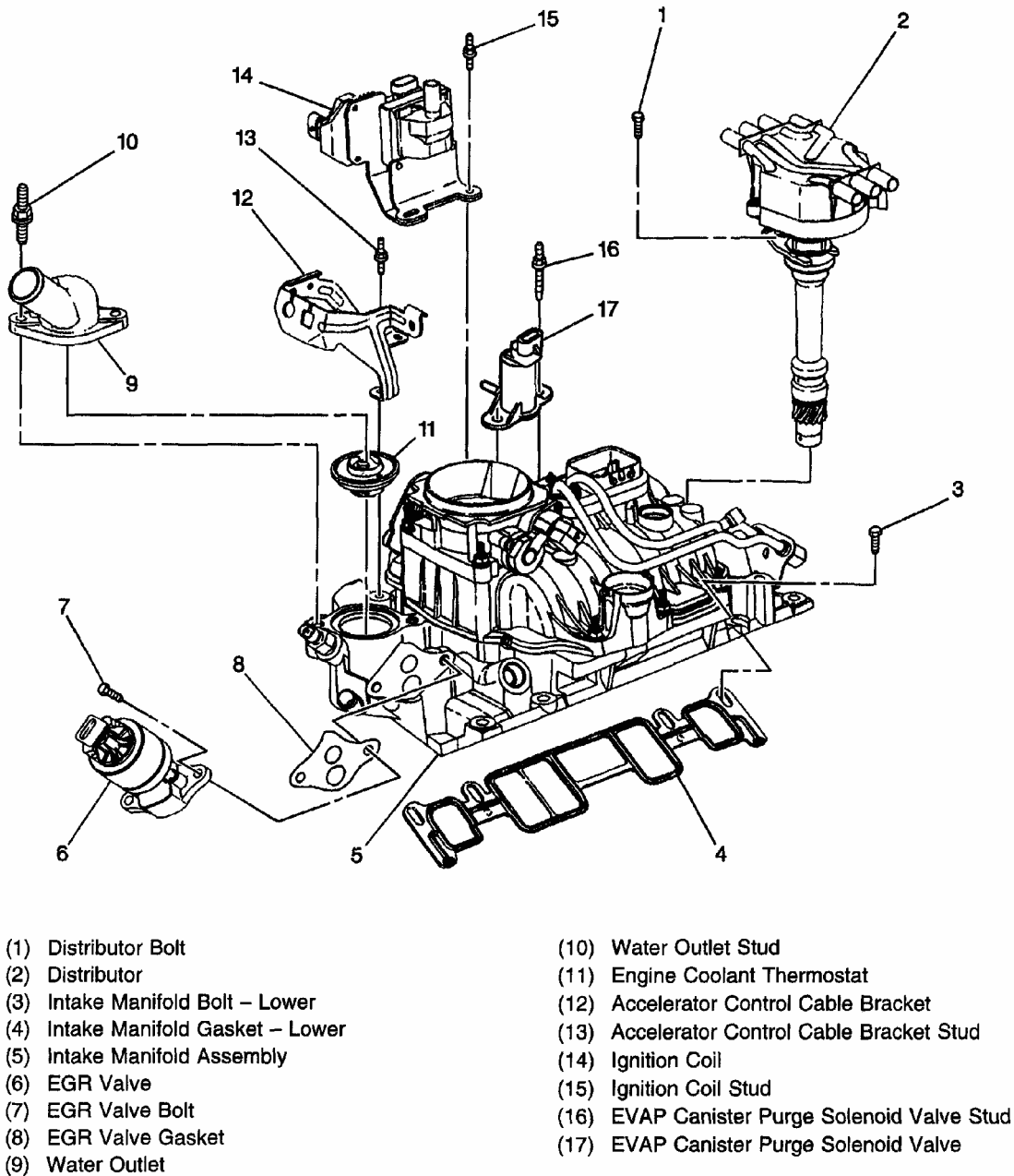
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|---|---|
| (1) Throttle Body to Upper Intake Manifold Gasket | (10) Spacer Ring – Metal Flat Washer |
| (2) Throttle Body | (11) Lower Fuel Seal – Black O-ring |
| (3) Throttle Body Attaching Stud | (12) Upper Manifold Attaching Stud |
| (4) Fuel Pipe Retainer Bracket Nut | (13) Upper Intake Manifold |
| (5) Fuel Pipe Retainer | (14) Upper Intake to Lower Intake Manifold Gasket |
| (6) Fuel Pipe | (15) Fuel Meter Body Seal – O-ring |
| (7) Fuel Pipe Bolt | (16) Fuel Meter Body – L35 |
| (8) Fuel Seal Retainer | (17) Intake Manifold |
| (9) Upper Fuel Seal – Yellow O-ring | (18) Fuel Meter Body – LU3 |

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Fig. 9: Identifying Upper & Lower Intake Manifold Components
Courtesy of GENERAL MOTORS CORP.

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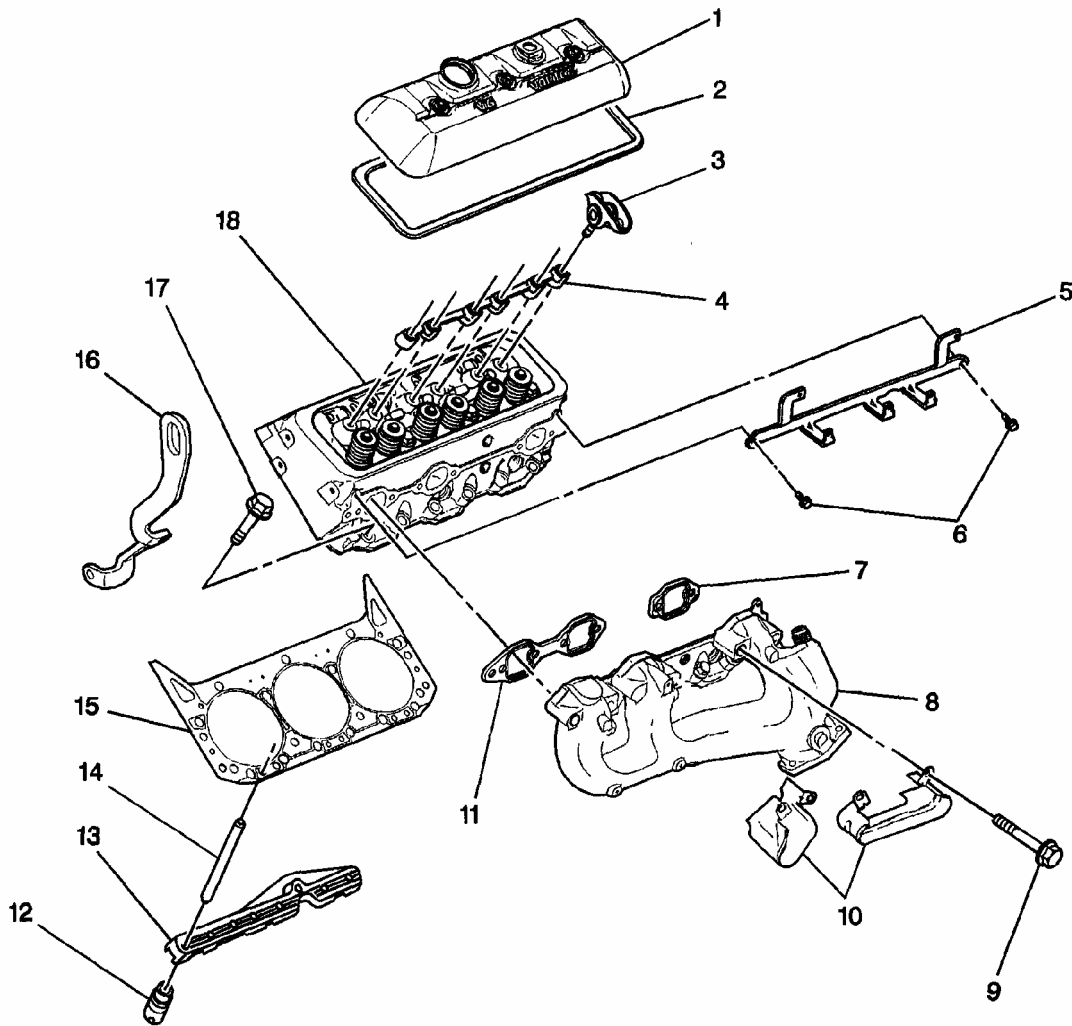


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Fig. 10: Identifying Upper Engine Components (View 1)
Courtesy of GENERAL MOTORS CORP.

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- (1) Valve Rocker Arm Cover
- (2) Valve Rocker Arm Cover Gasket
- (3) Valve Rocker Arm Assembly
- (4) Valve Rocker Arm Support
- (5) Spark Plug Wire Support
- (6) Spark Plug Wire Support Bolt
- (7) Exhaust Manifold Gasket
- (8) Exhaust Manifold
- (9) Exhaust Manifold Bolt

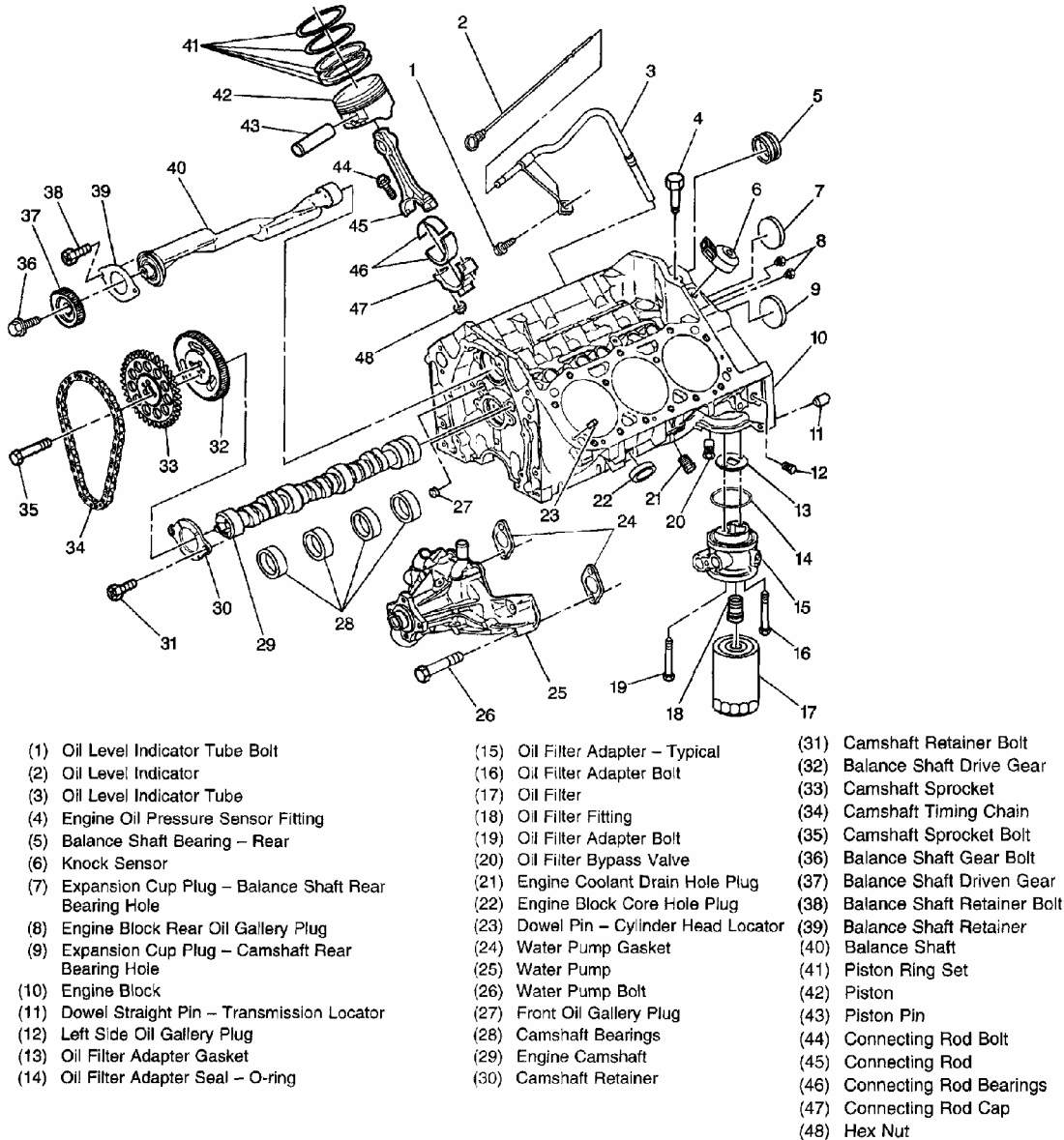
- (10) Spark Plug Wire Shields
- (11) Exhaust Manifold Gasket
- (12) Valve Lifter
- (13) Valve Lifter Pushrod Guide
- (14) Valve Pushrod
- (15) Cylinder Head Gasket
- (16) Engine Lift Front Bracket
- (17) Cylinder Head Bolt
- (18) Cylinder Head

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Fig. 11: Identifying Upper Engine Components (View 2)
Courtesy of GENERAL MOTORS CORP.

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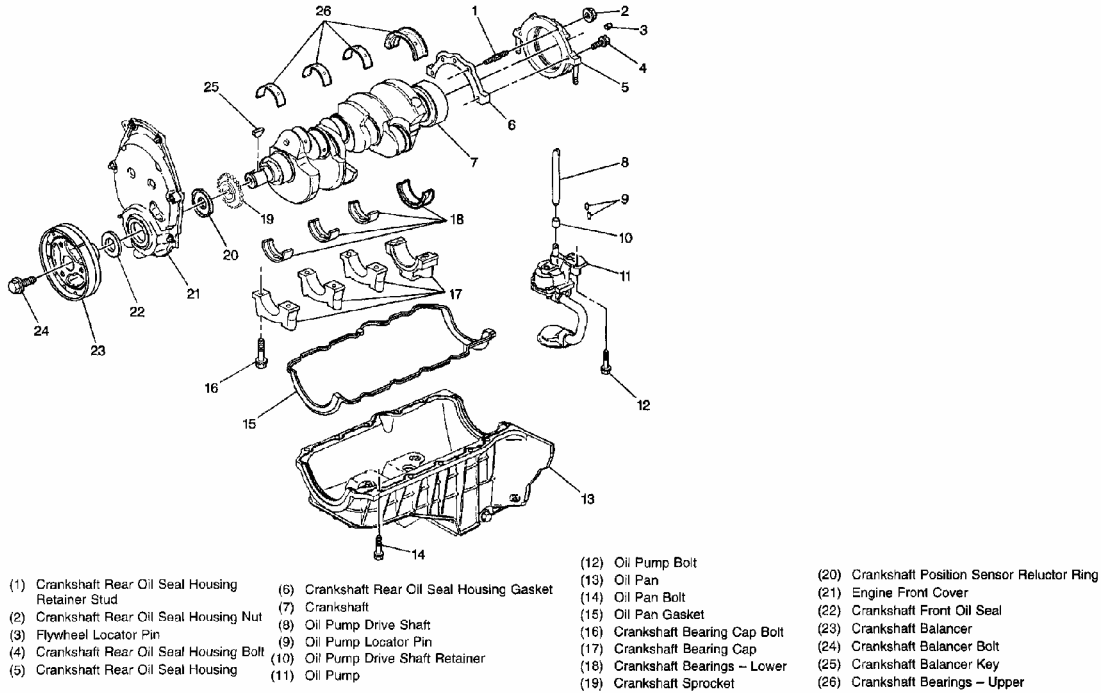


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Fig. 12: Identifying Lower Engine Components (View 1)
 Courtesy of GENERAL MOTORS CORP.

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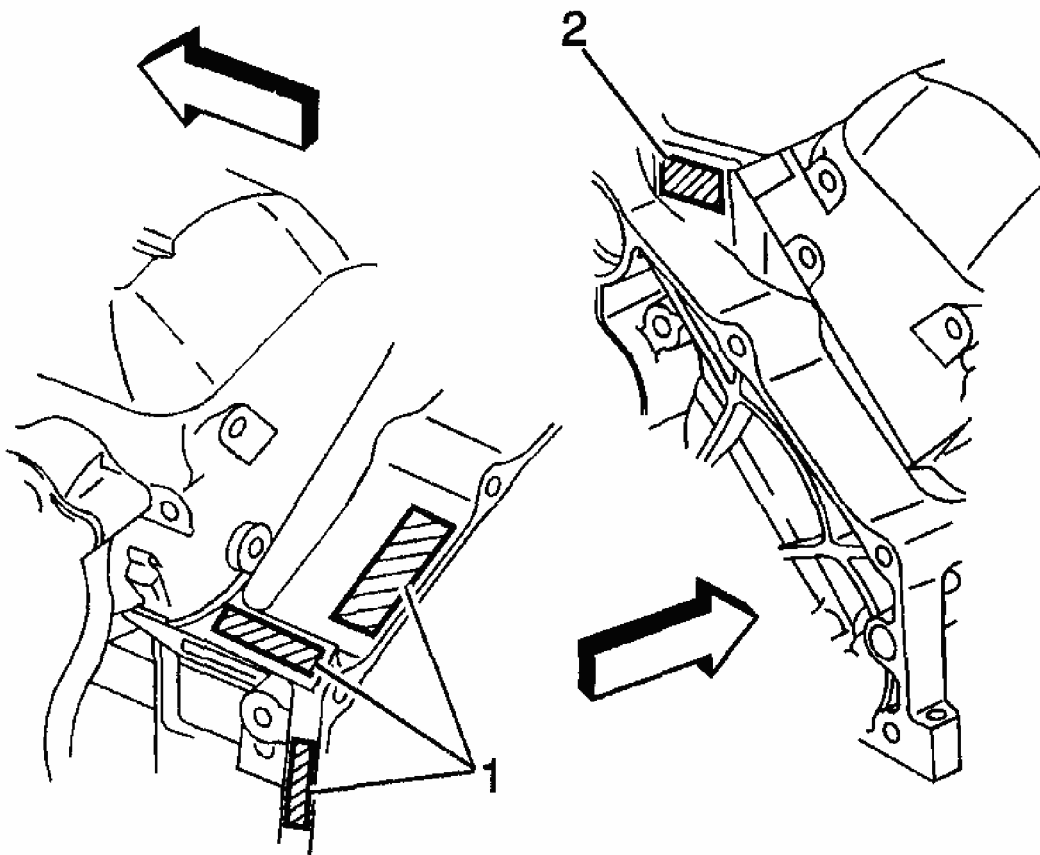
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Fig. 13: Identifying Lower Engine Components (View 2)
Courtesy of GENERAL MOTORS CORP.

ENGINE IDENTIFICATION



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Fig. 14: Locating VIN On Left & Right Rear Side Of Engine Block
Courtesy of GENERAL MOTORS CORP.

- The Vehicle Identification Number (VIN) Derivative is located on the left side rear of the engine block (1) or on the right side rear (2) and typically is a nine digit number stamped or laser etched onto the engine at the vehicle assembly plant.
 - The first digit identifies the division.
 - The second digit identifies the model year.
 - The third digit identifies the assembly plant.
 - The fourth through ninth digits are the last six digits of the Vehicle Identification Number (VIN).
- Engines built at the Tonawanda engine plant have the engine identification number located at the right front top of the engine block.
 - The first digit (1) is the source code.
 - The second and third digits (2) are the month of build.
 - The forth and fifth digits (3) are the date of build.

- The sixth, seventh, and eighth digits (4) are the broadcast code.

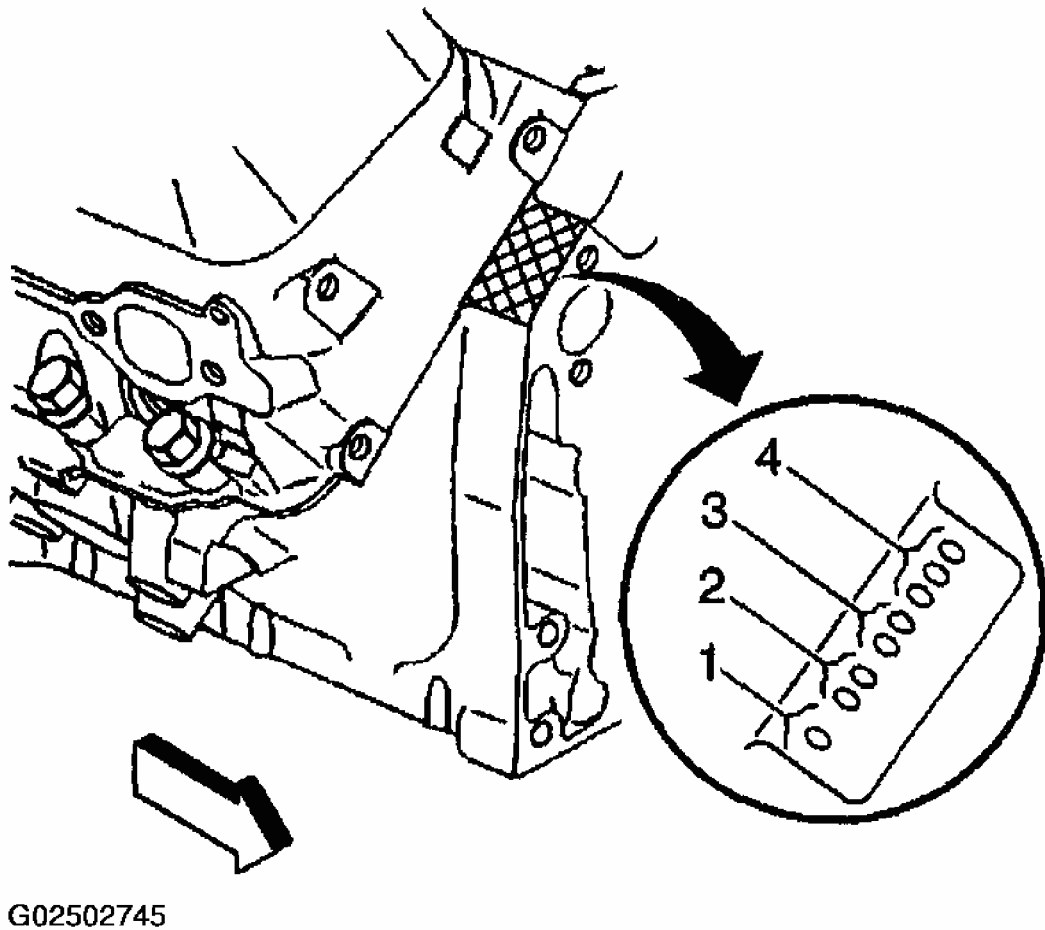
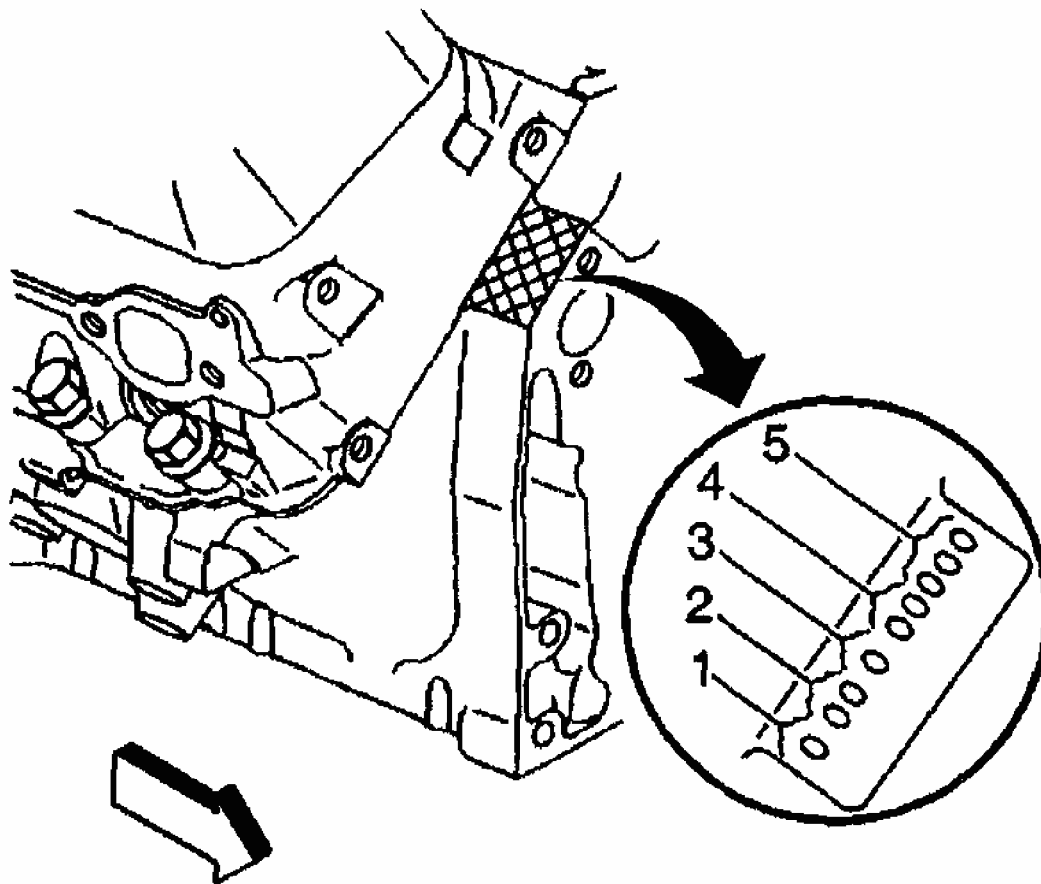


Fig. 15: Locating VIN On Right Front Top Of Engine Block (Tonawanda Plant)

Courtesy of GENERAL MOTORS CORP.

- Engines built at the Romulus engine plant have the engine identification number located at the right front top of the engine block.
 - The first digit (1) is the source code.
 - The second and third digits (2) are the month of build.
 - The fourth digit (3) is the hour of the build.
 - The fifth and sixth digits (4) are the date of build.



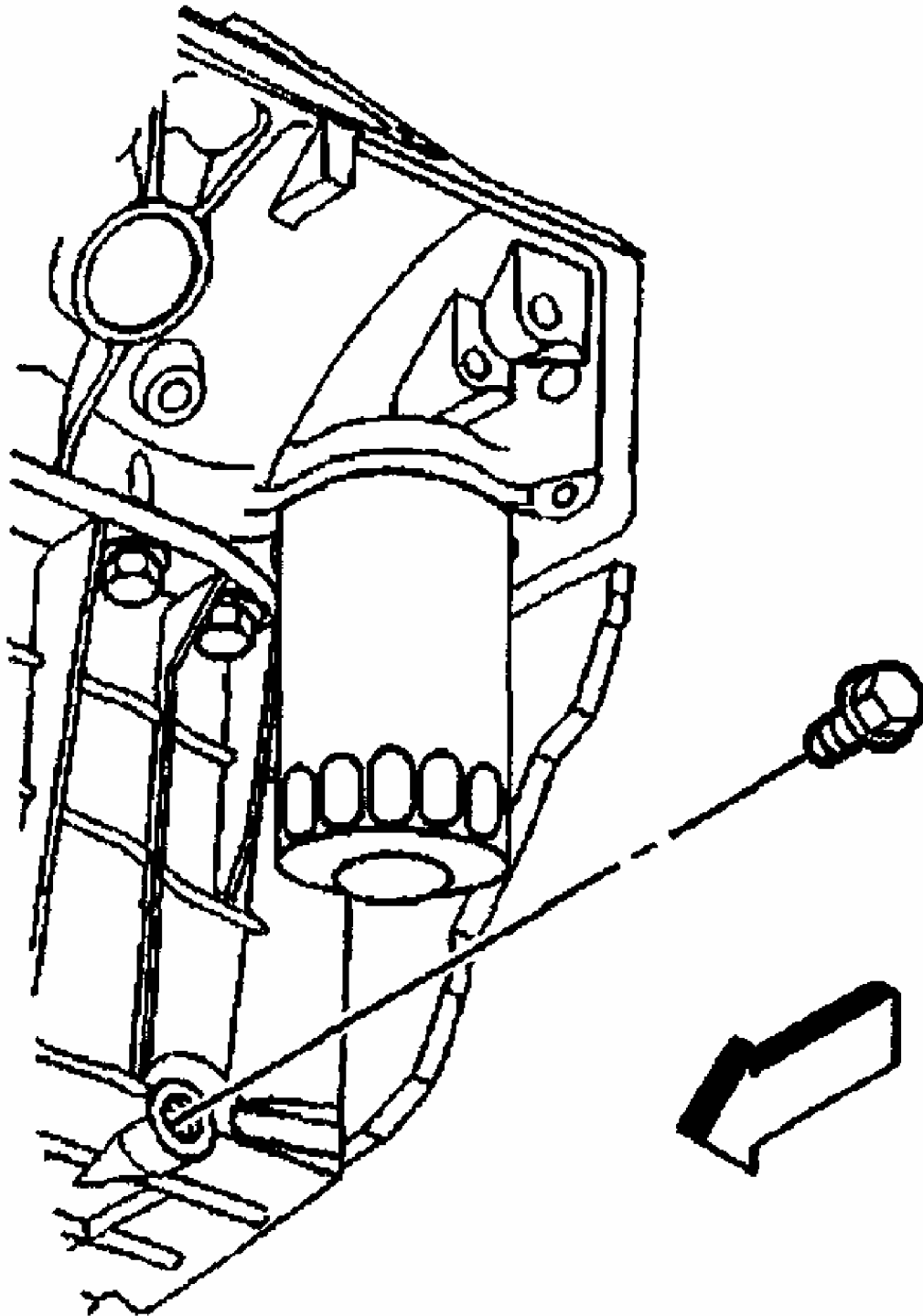
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Fig. 16: Locating VIN On Right Front Top Of Engine Block (Romulus Plant)
Courtesy of GENERAL MOTORS CORP.

REPAIR INSTRUCTIONS

DRAINING FLUIDS & OIL FILTER REMOVAL

1. Remove the oil pan drain plug and allow the engine oil to drain into a suitable container.



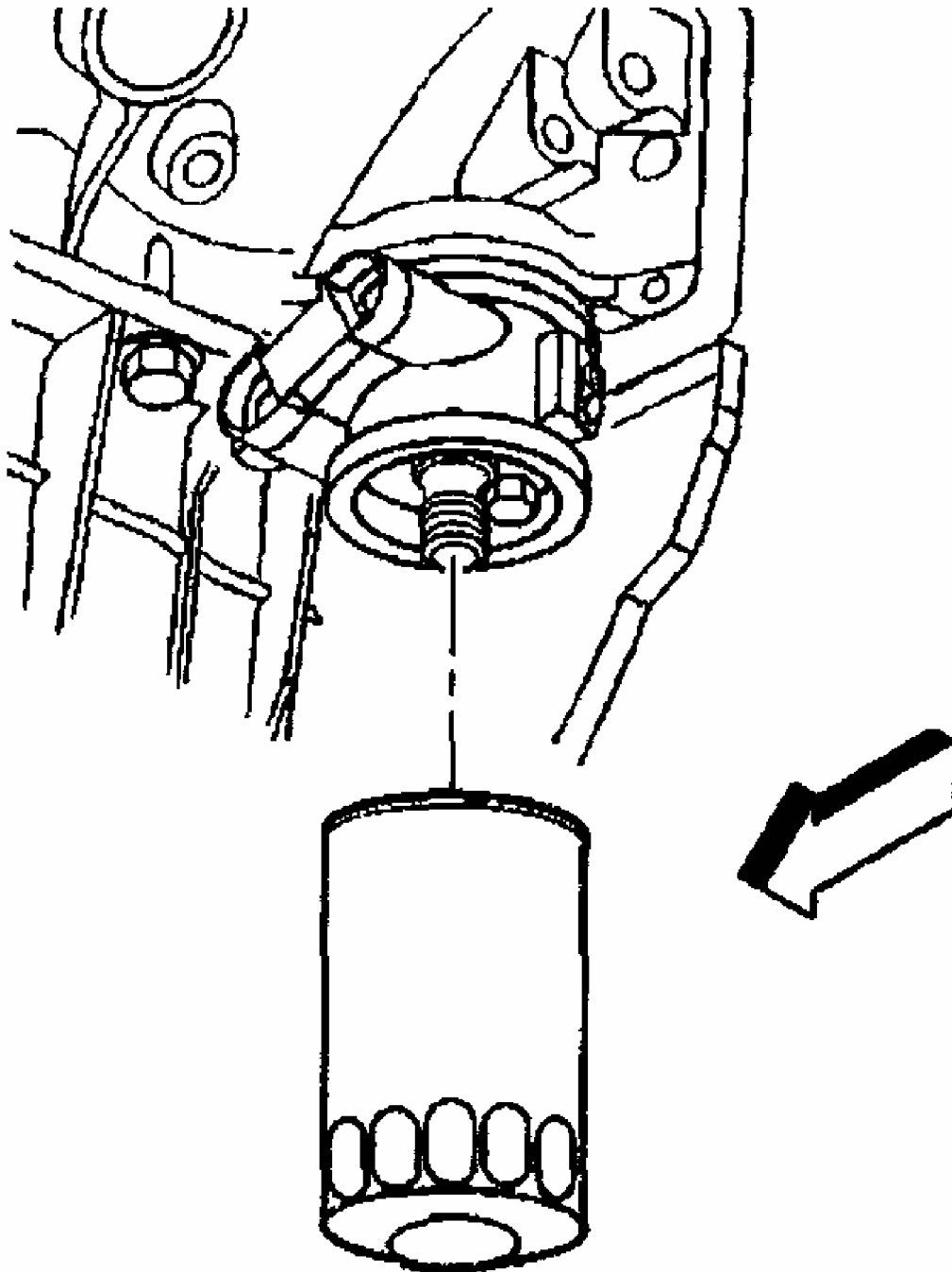
G02502747

Fig. 17: Oil Pan Drain Plug
Courtesy of GENERAL MOTORS CORP.

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

2. Remove the oil filter, if applicable.
3. Discard the oil filter, if applicable.

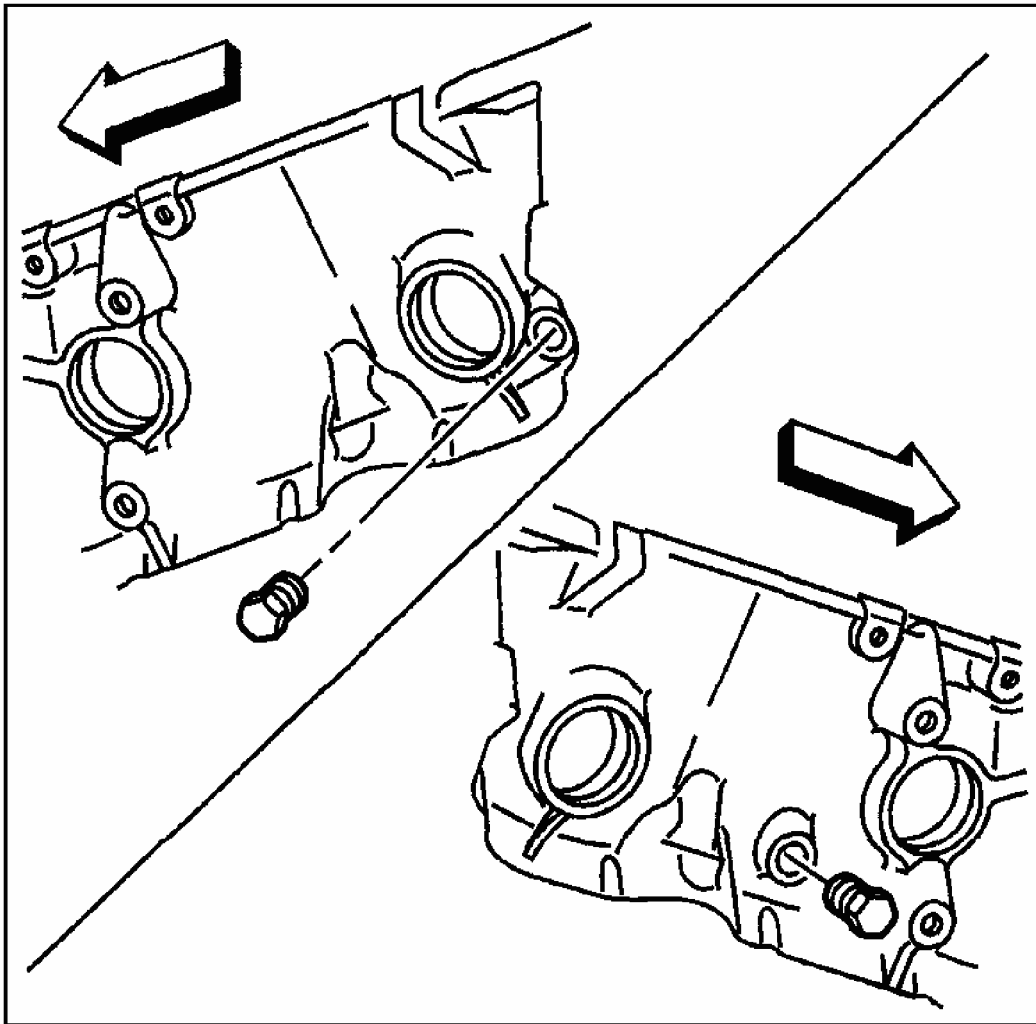


G02502748

Fig. 18: Oil Filter

Courtesy of GENERAL MOTORS CORP.

4. Remove both the engine block coolant drain hole plugs and allow the coolant to drain into a suitable container.



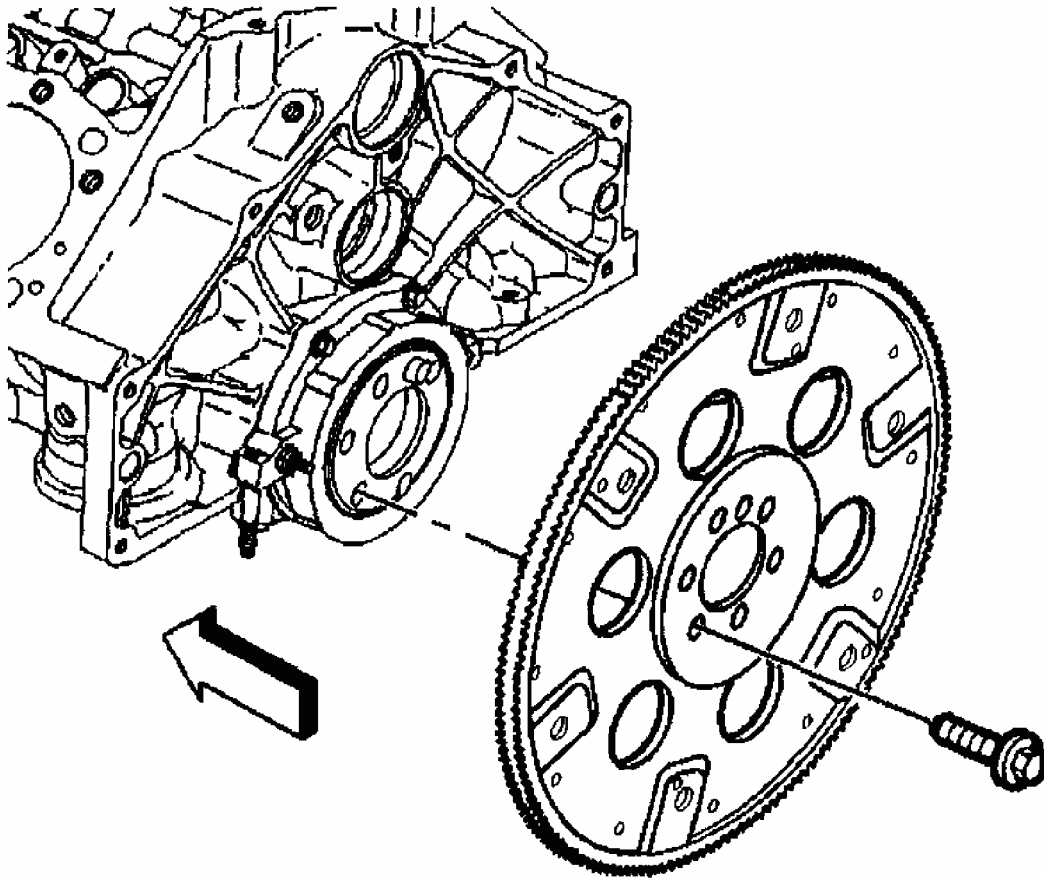
G02502749

Fig. 19: Engine Block Coolant Drain Hole Plugs

Courtesy of GENERAL MOTORS CORP.

ENGINE FLYWHEEL REMOVAL

1. Remove the engine flywheel bolts.
2. Remove the engine flywheel.



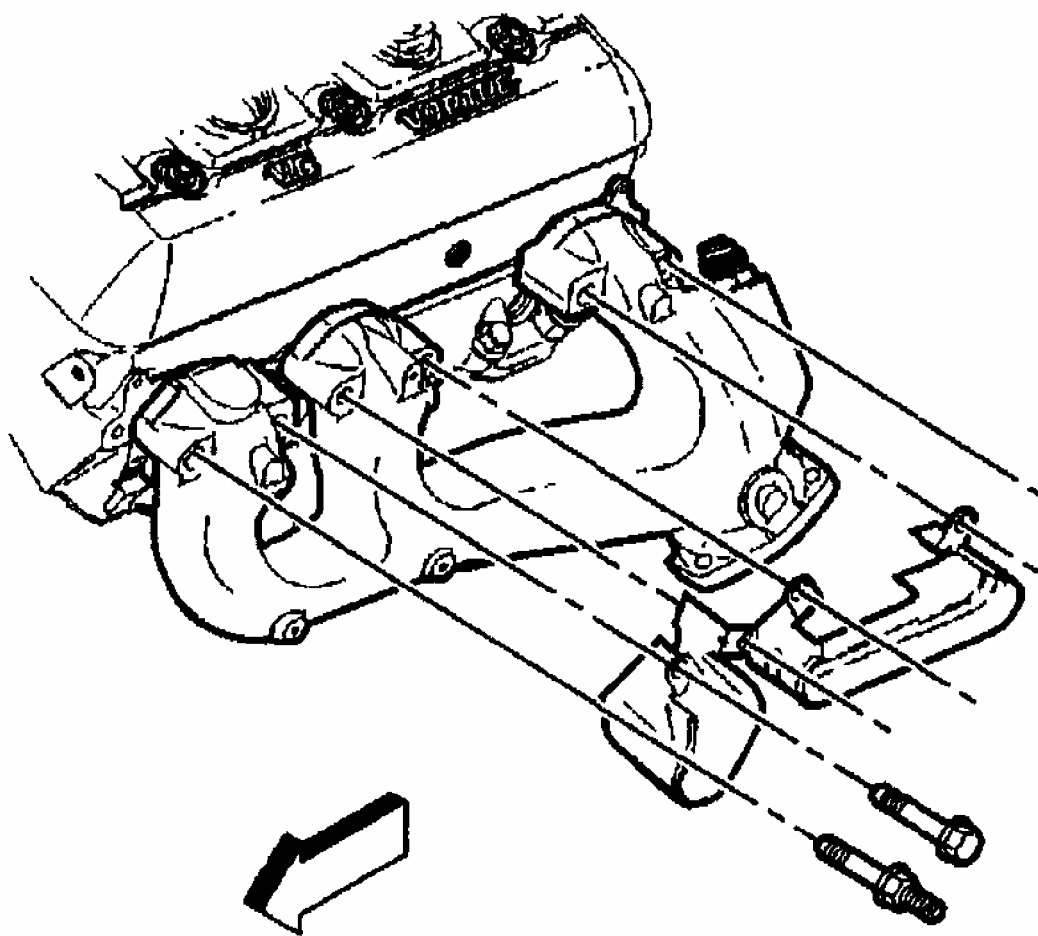
G02502750

Fig. 20: Engine Flywheel
Courtesy of GENERAL MOTORS CORP.

EXHAUST MANIFOLD REMOVAL - LEFT

NOTE: Twist the spark plug boot one-half turn in order to release the boot. Pull on the spark plug boot only. Do not pull on the spark plug wire or the wire could be damaged.

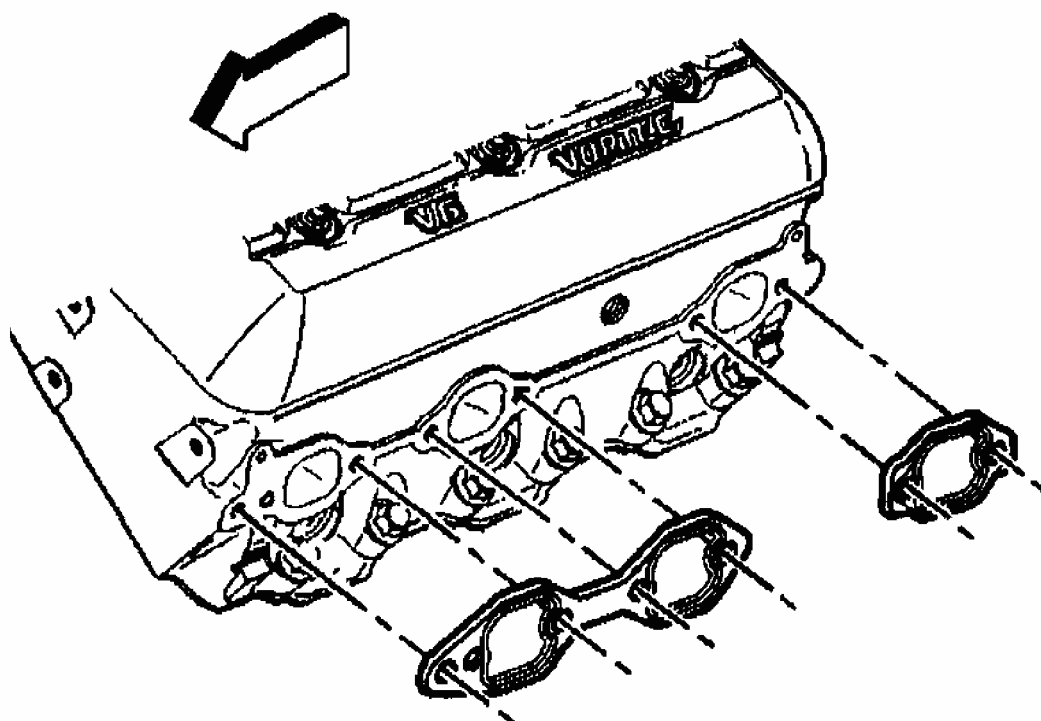
1. Remove the spark plug wires from the spark plugs.
 - 1.1. Rotate the spark plug wire boot one half turn.
 - 1.2. Pull outward on the spark plug wire boot to release from the spark plug.
2. Remove the spark plug wires from the spark plug wire retainers.
3. Remove the exhaust manifold bolts and the stud.
4. Remove the spark plug wire shields, if applicable, and the exhaust manifold.



G02502754

Fig. 21: Spark Plug Wire Shields
Courtesy of GENERAL MOTORS CORP.

5. Remove and discard the exhaust manifold gaskets.



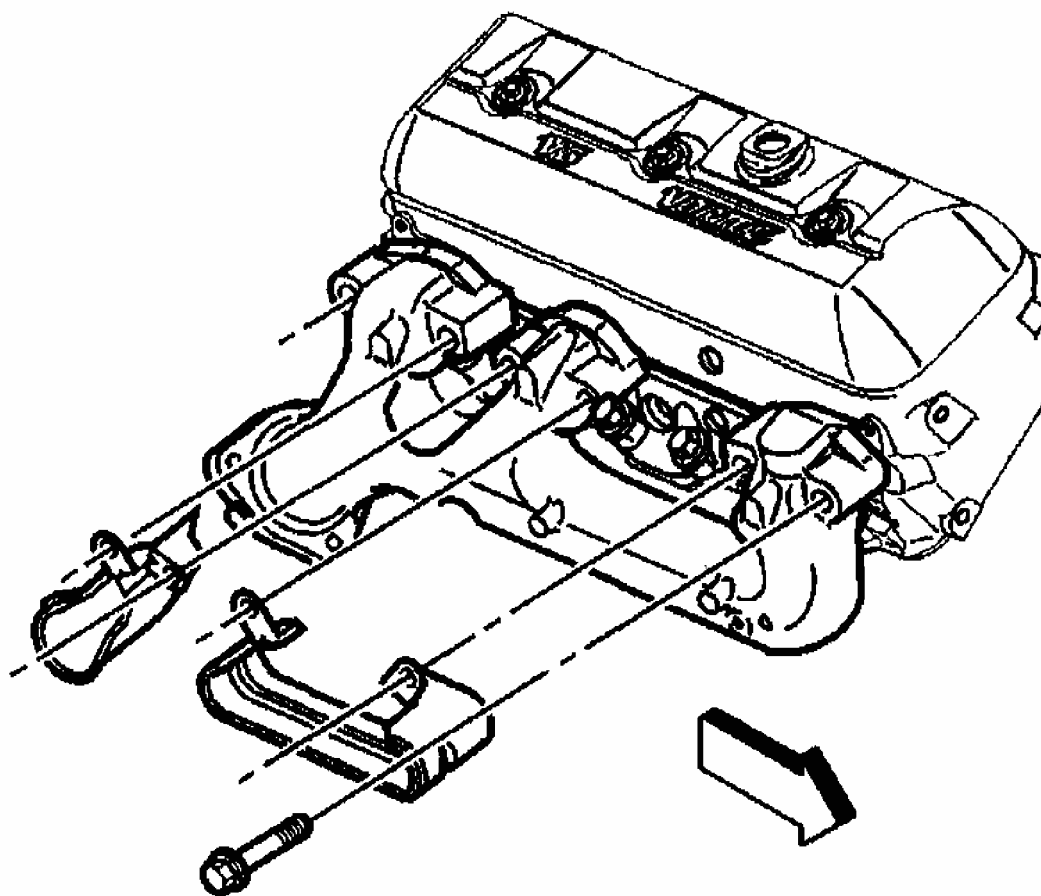
G02502755

Fig. 22: Exhaust Manifold Gaskets
Courtesy of GENERAL MOTORS CORP.

EXHAUST MANIFOLD REMOVAL - RIGHT

NOTE: Twist the spark plug boot one-half turn in order to release the boot. Pull on the spark plug boot only. Do not pull on the spark plug wire or the wire could be damaged.

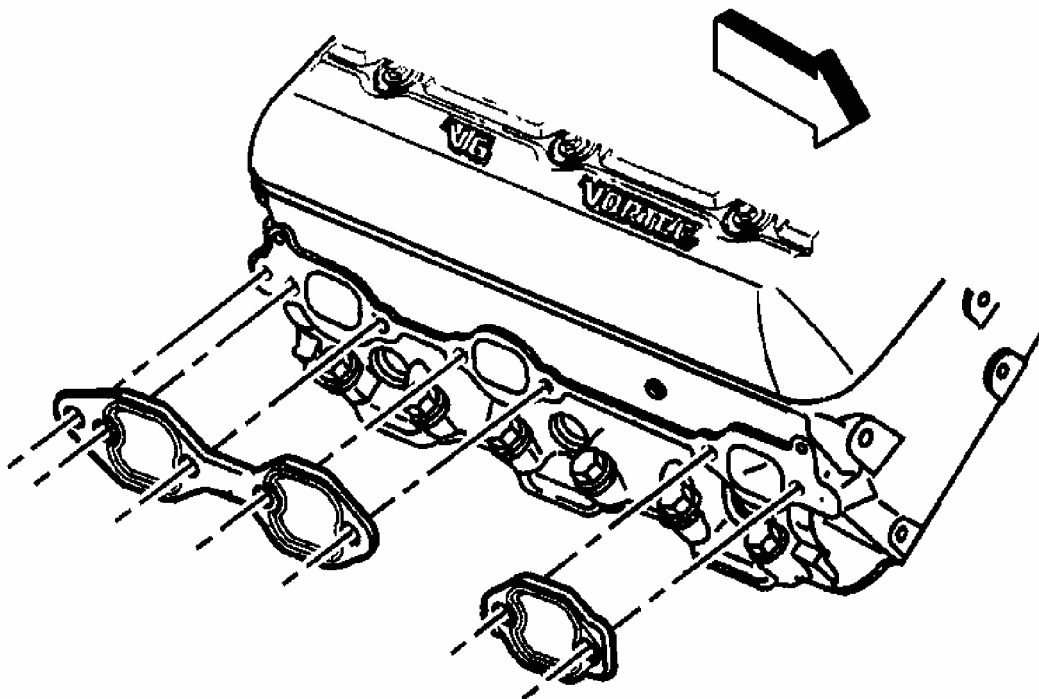
1. Remove the spark plug wires from the spark plugs.
 - 1.1. Rotate the spark plug wire boot one half turn.
 - 1.2. Pull outward on the spark plug wire boot to release from the spark plug.
2. Remove the spark plug wires from the spark plug wire retainers.
3. Remove the exhaust manifold bolts.
4. Remove the spark plug wire shields and the exhaust manifold.



G02502756

Fig. 23: Spark Plug Wire Shields
Courtesy of GENERAL MOTORS CORP.

5. Remove and discard the exhaust manifold gaskets.

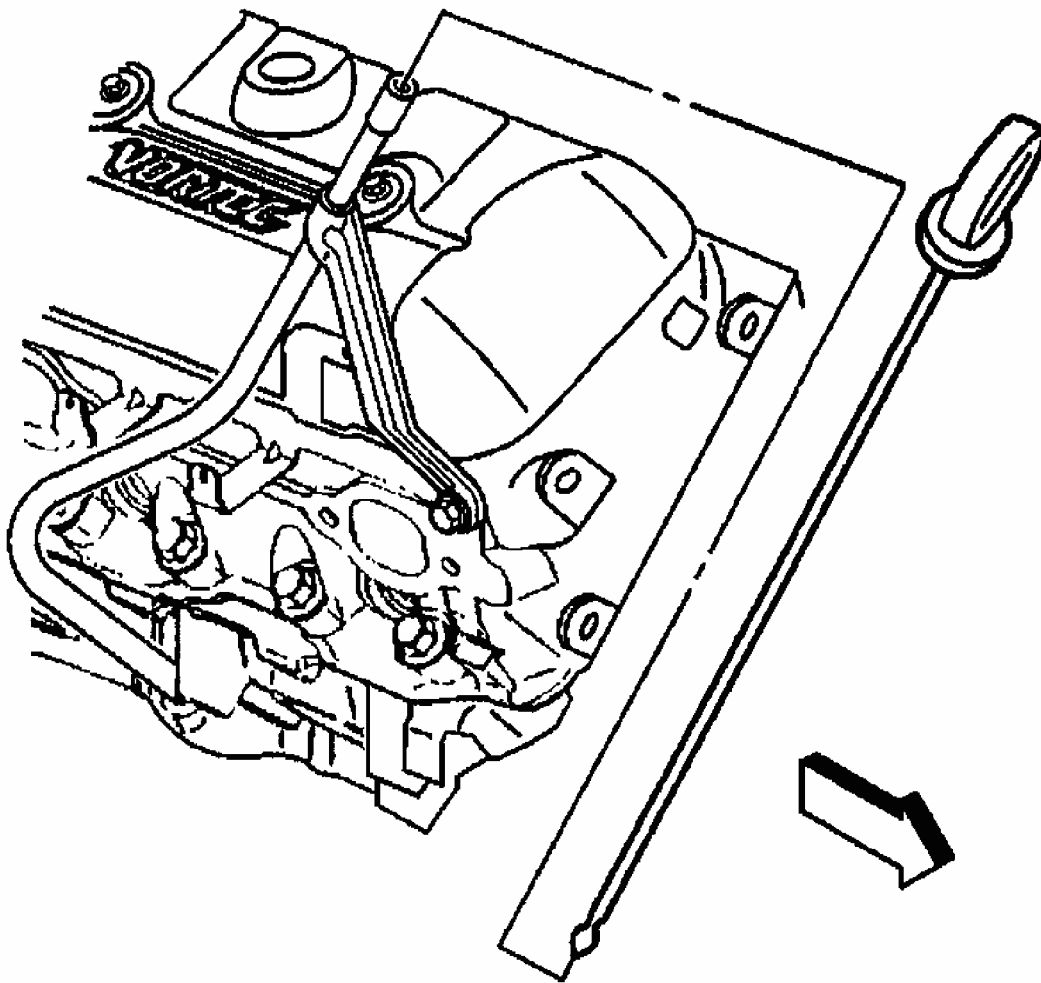


G02502757

Fig. 24: Exhaust Manifold Gaskets
Courtesy of GENERAL MOTORS CORP.

OIL LEVEL INDICATOR & TUBE REMOVAL

1. Remove the oil level indicator from the oil level indicator tube, if required.



G02502758

Fig. 25: Oil Level Indicator & Tube
Courtesy of GENERAL MOTORS CORP.

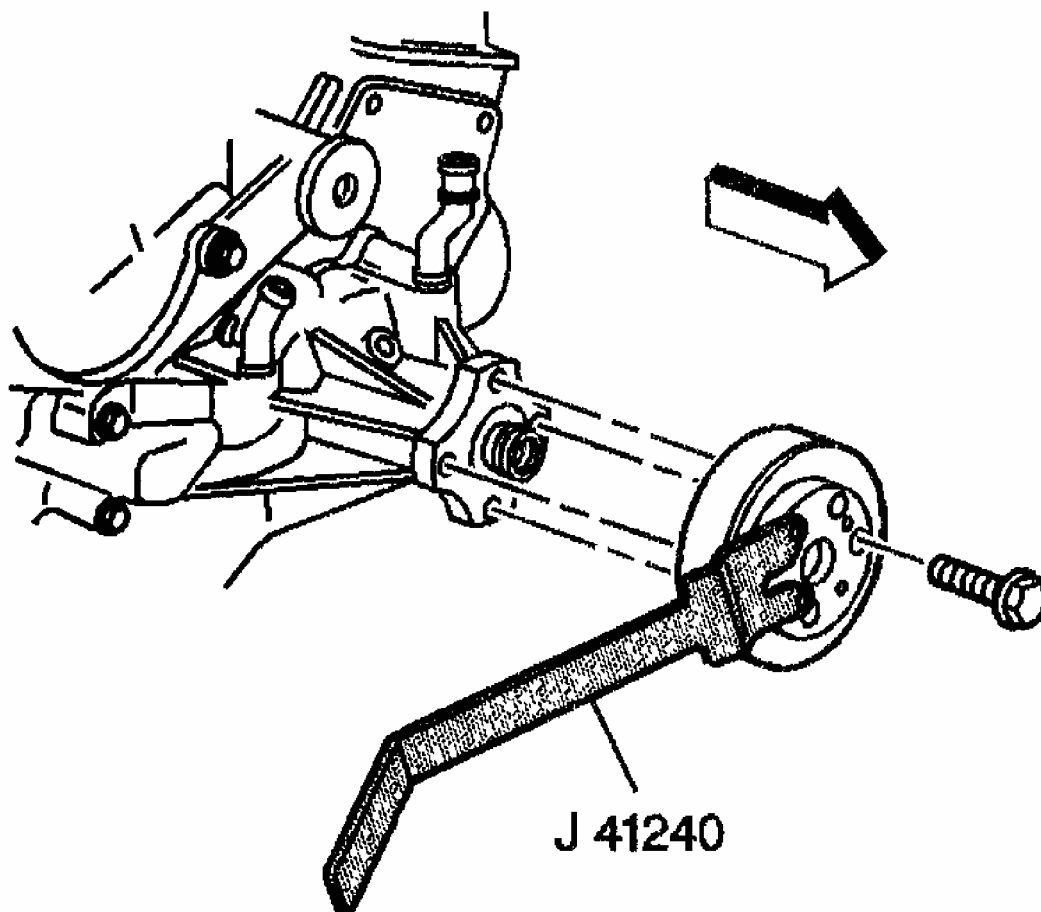
2. Remove the oil level indicator tube bolt.
3. Remove the oil level indicator tube from the engine block.

WATER PUMP REMOVAL

Tools Required

J 41240 Fan Clutch Remover and Installer

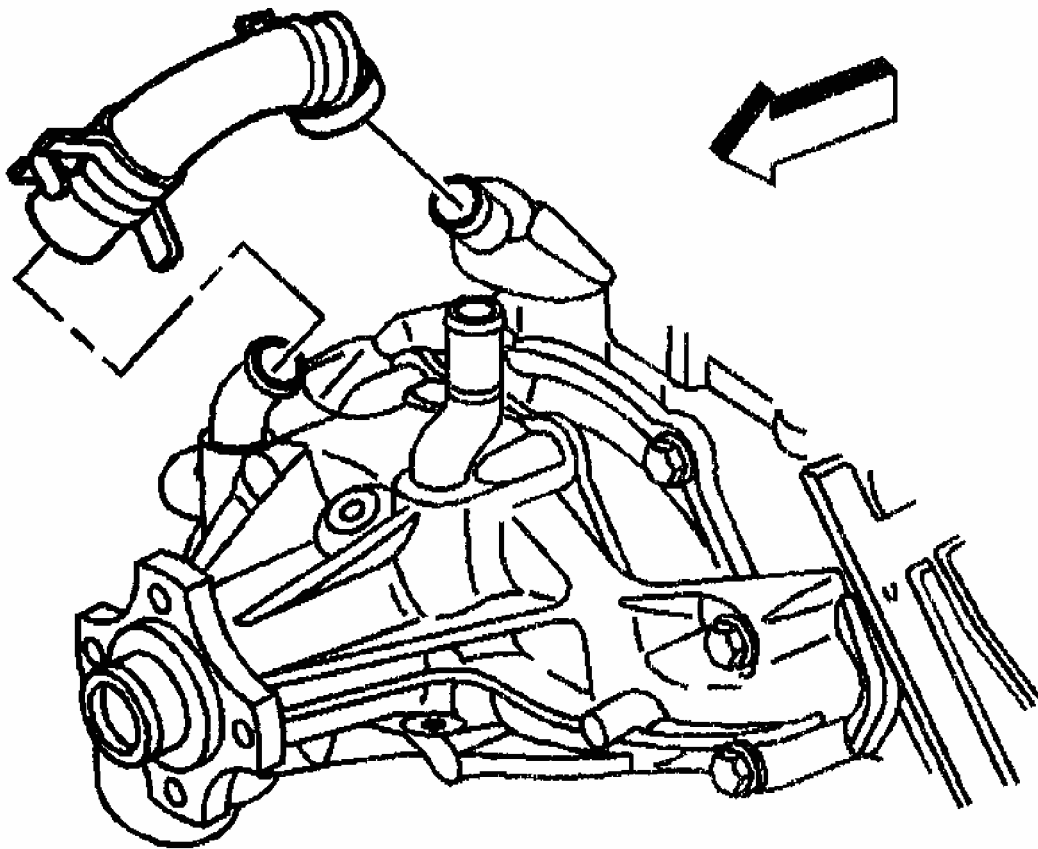
1. Remove the bolts and the fan and water pump pulley using the **J 41240**.



G02502760

Fig. 26: Removing Water Pump Pulley
Courtesy of GENERAL MOTORS CORP.

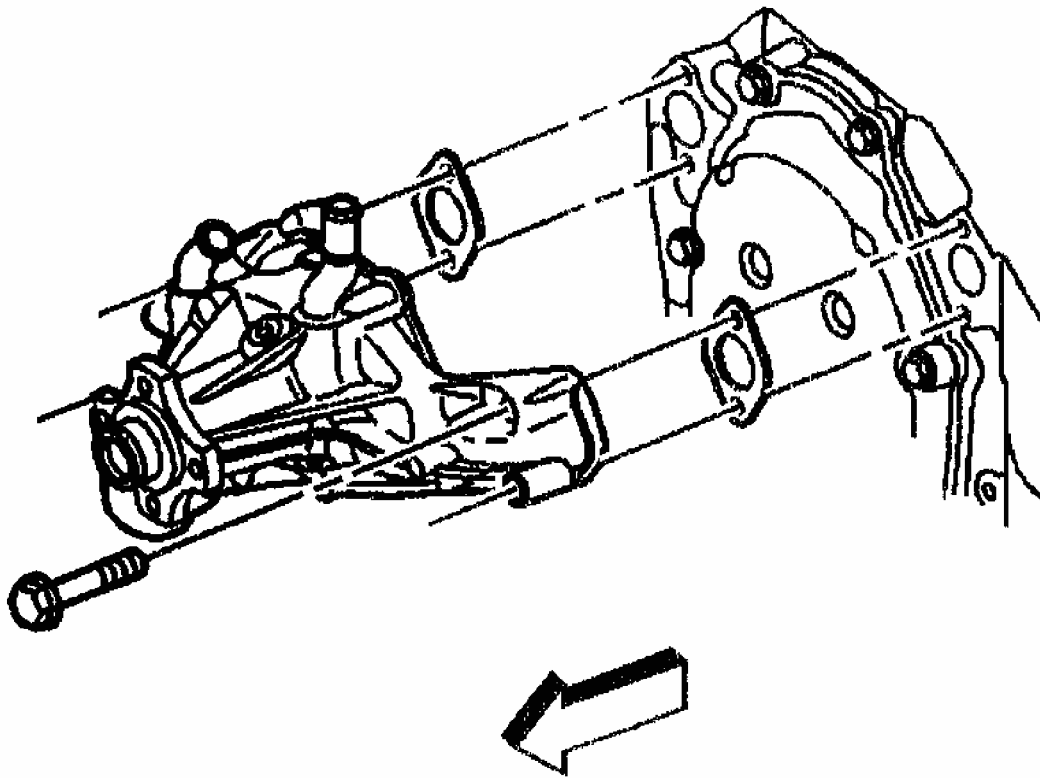
2. Remove the clamps and the water pump inlet hose.



G02502761

Fig. 27: Water Pump Inlet Hose
Courtesy of GENERAL MOTORS CORP.

3. Remove the water pump bolts.
4. Remove the water pump.
5. Remove the water pump gaskets.
6. Discard the water pump gaskets.



G02502762

Fig. 28: Water Pump & Gaskets
Courtesy of GENERAL MOTORS CORP.

CRANKSHAFT BALANCER REMOVAL

Tools Required

J 23523-F Balancer Remover and Installer

1. Remove the crankshaft balancer bolt and washer.

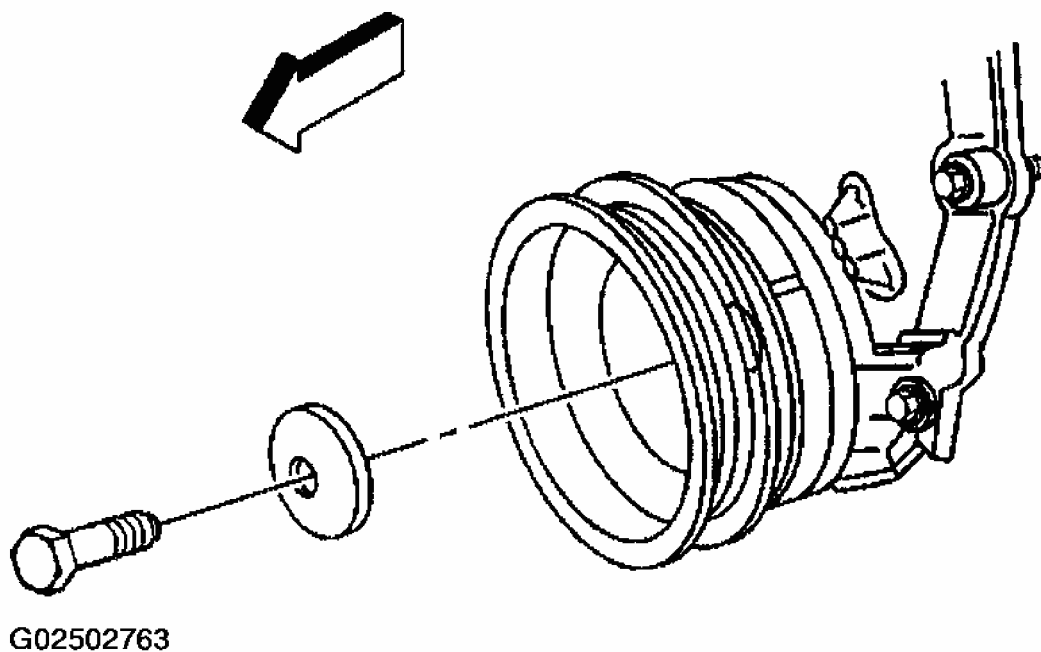
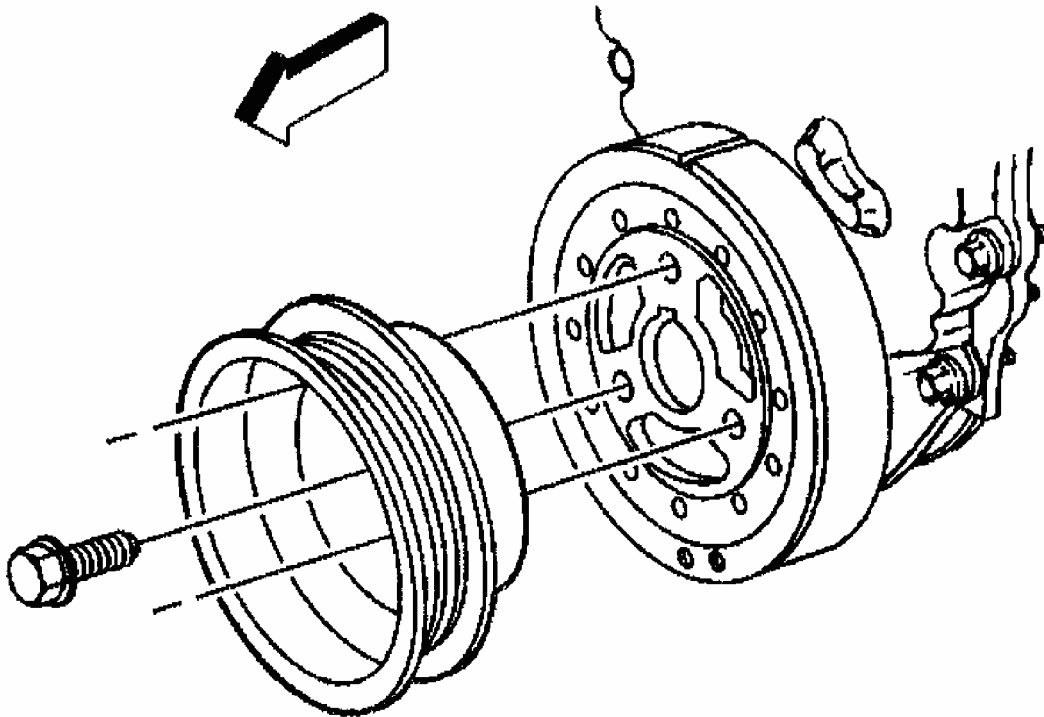


Fig. 29: Crankshaft Balancer Bolt & Washer
Courtesy of GENERAL MOTORS CORP.

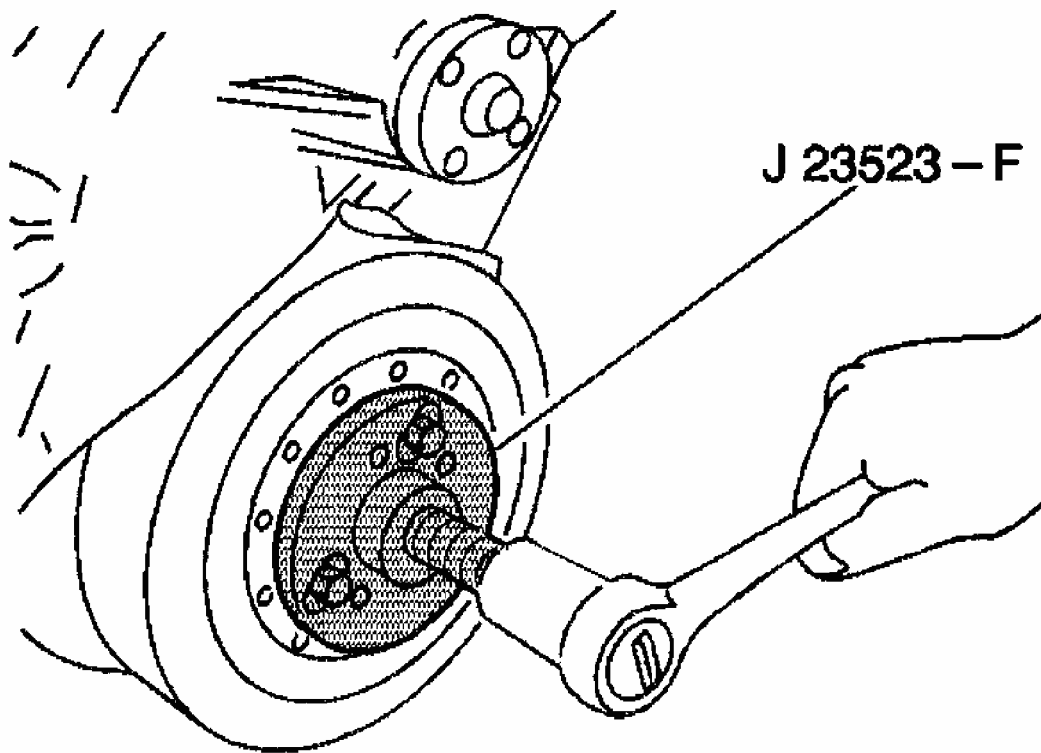
2. Remove the bolts and the crankshaft pulley.



G02502764

Fig. 30: Crankshaft Pulley
Courtesy of GENERAL MOTORS CORP.

3. Use the **J 23523-F** in order to remove the crankshaft balancer.
 - 3.1. Install the **J 23523-F** plate and bolts onto the crankshaft balancer. Tighten the bolts to 25 N.m (18 lb ft).
 - 3.2. Install the **J 23523-F** forcing screw into the plate.
 - 3.3. Rotate the **J 23523-F** forcing screw clockwise in order to remove the crankshaft balancer.
4. Remove the **J 23523-F** from the crankshaft balancer.

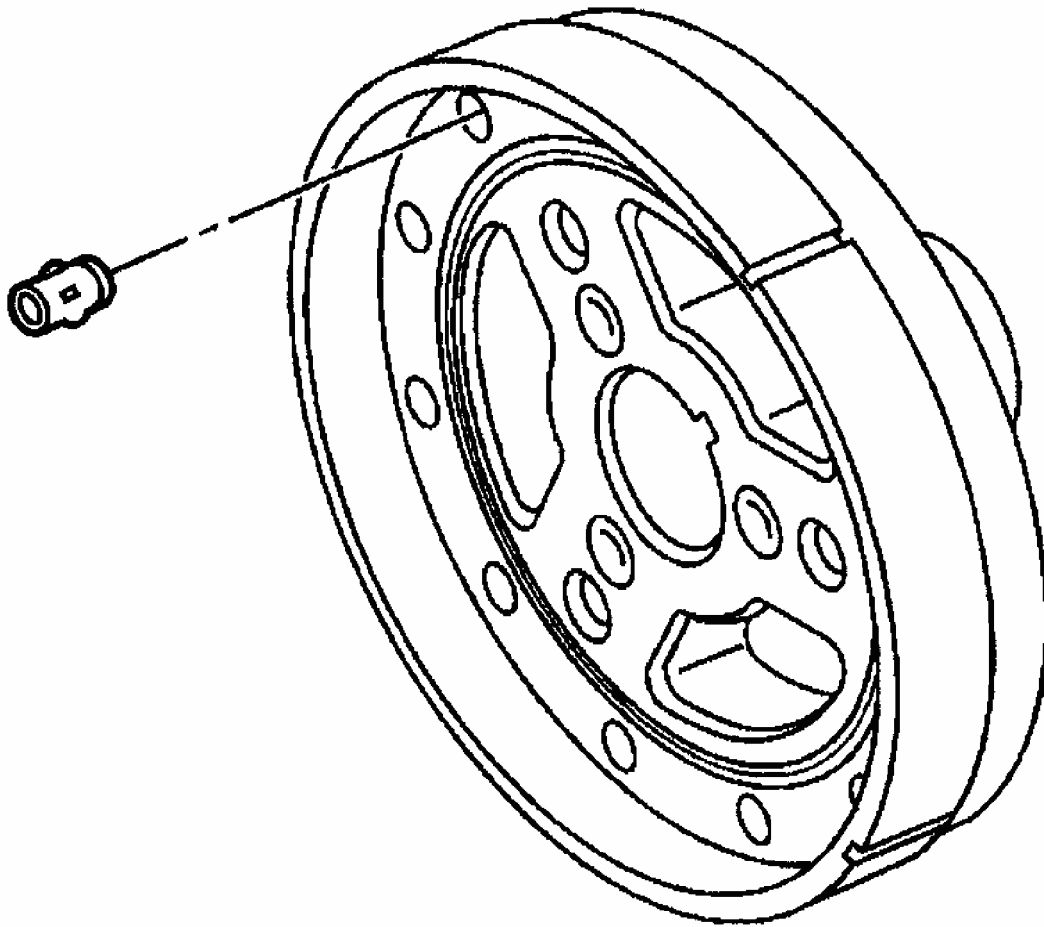


G02502765

Fig. 31: Removing Crankshaft Balancer
Courtesy of GENERAL MOTORS CORP.

Important: If replacing the crankshaft balancer, NEW weights must be installed into the NEW crankshaft balancer, in the same location as the old weights in the old balancer.

5. Note the position and length of any crankshaft balancer front groove pins, if applicable.

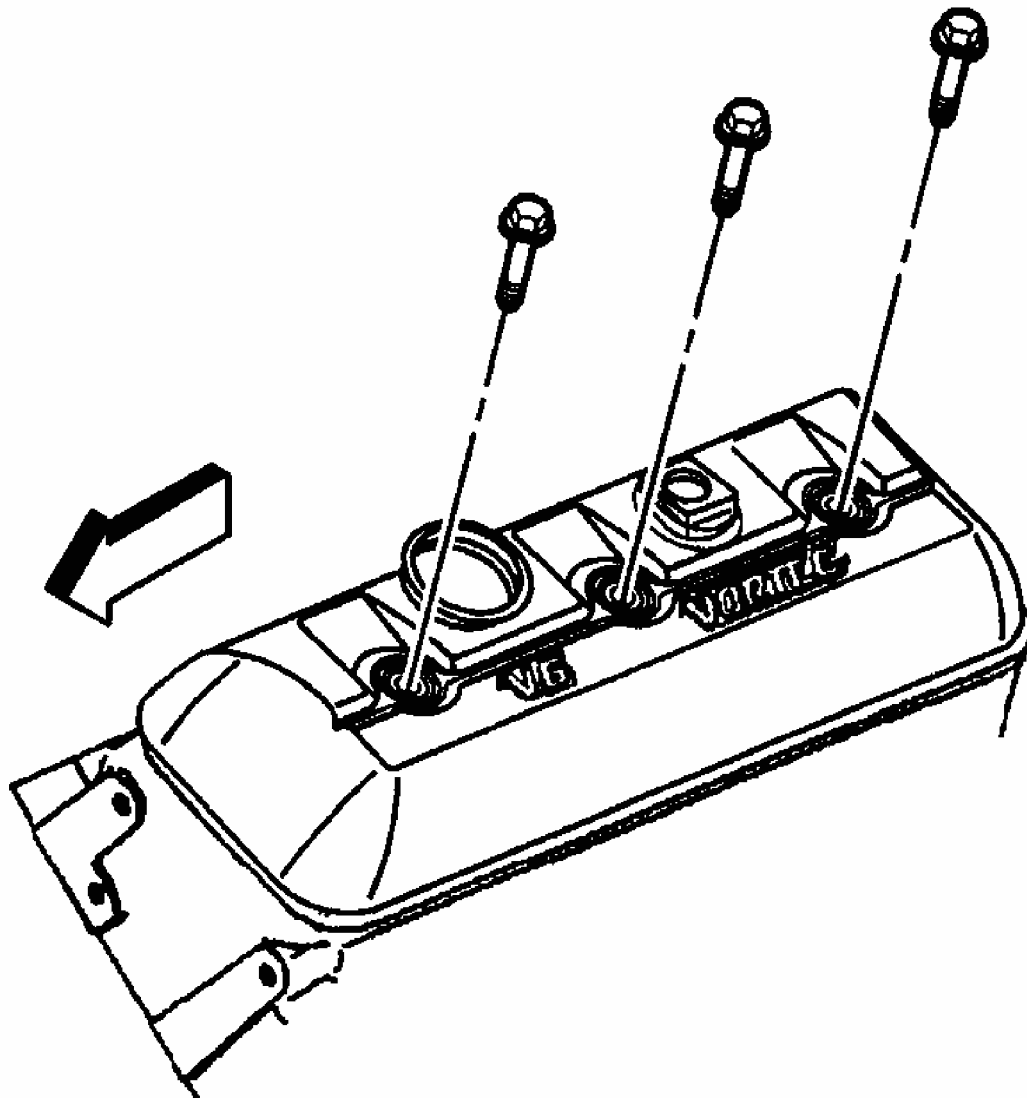


G02502766

Fig. 32: Crankshaft Balancer Front Groove Pins
Courtesy of GENERAL MOTORS CORP.

VALVE ROCKER ARM COVER REMOVAL - LEFT

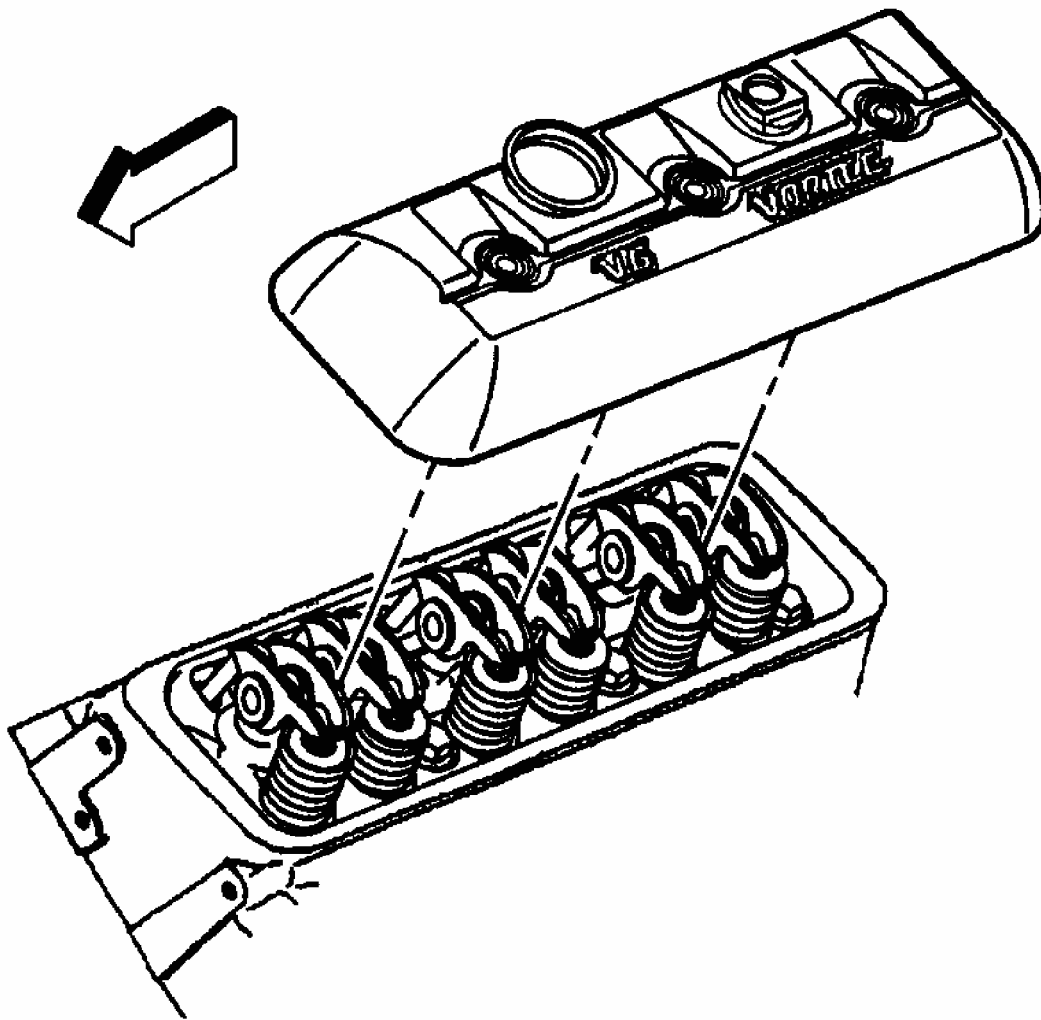
1. Remove the valve rocker arm cover bolts.
2. Remove the valve rocker arm cover bolt grommets.
3. Discard the valve rocker arm cover bolt grommets.



G02502767

Fig. 33: Valve Rocker Arm Cover Bolt
Courtesy of GENERAL MOTORS CORP.

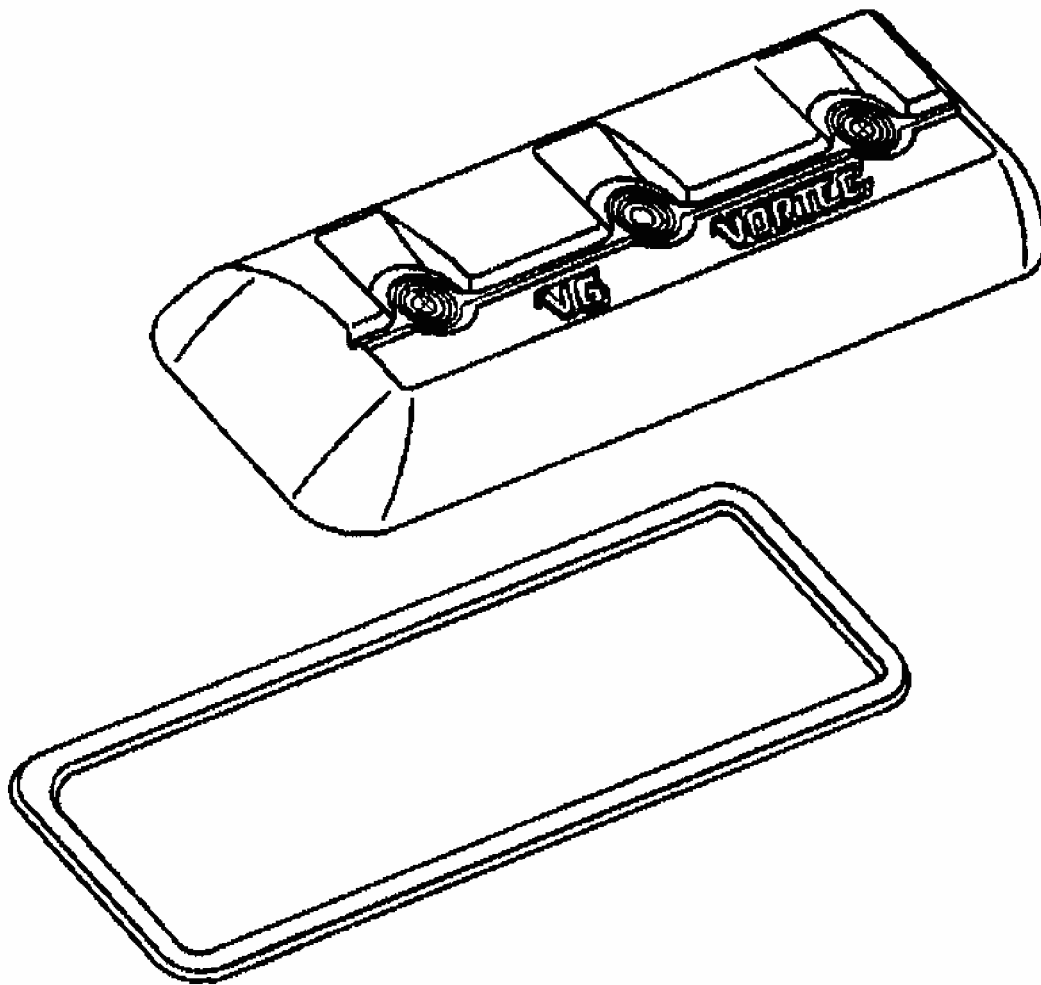
4. Remove the valve rocker arm cover.



G02502768

Fig. 34: Valve Rocker Arm Cover
Courtesy of GENERAL MOTORS CORP.

5. Remove the valve rocker arm cover gasket.
6. Discard the valve rocker arm cover gasket.

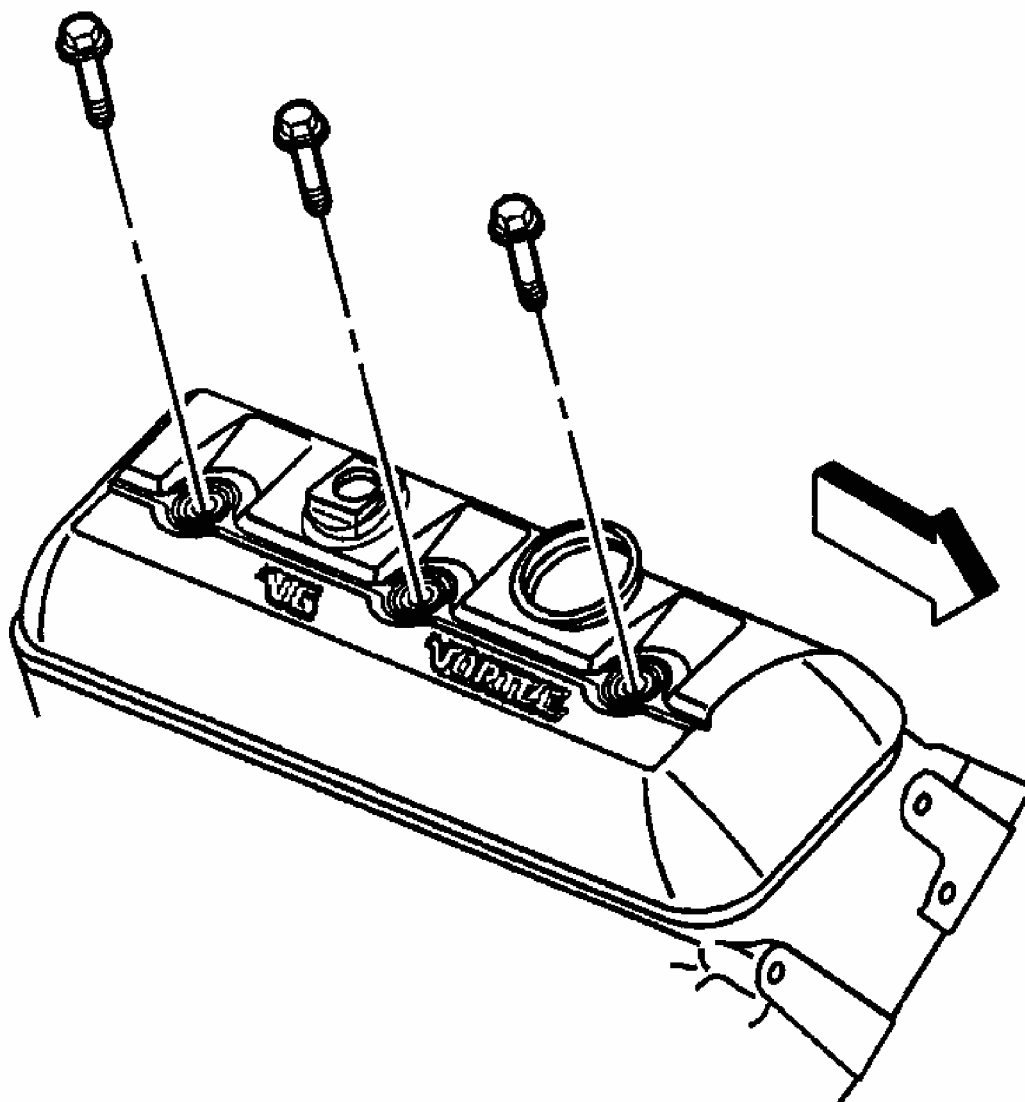


G02502769

Fig. 35: Valve Rocker Arm Cover Gasket
Courtesy of GENERAL MOTORS CORP.

VALVE ROCKER ARM COVER REMOVAL - RIGHT

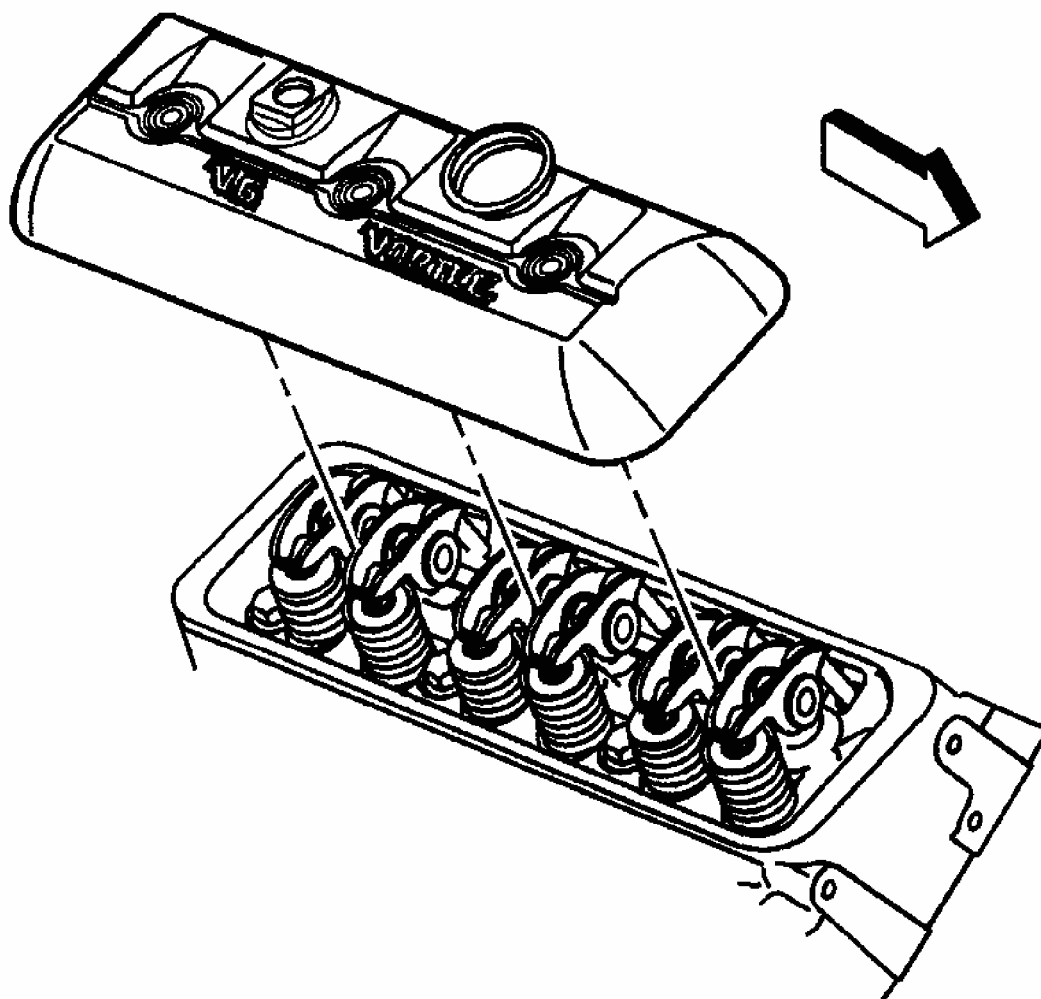
1. Remove the valve rocker arm cover bolts.
2. Remove the valve rocker arm cover bolt grommets.
3. Discard the valve rocker arm cover bolt grommets.



G02502770

Fig. 36: Valve Rocker Arm Cover Bolt
Courtesy of GENERAL MOTORS CORP.

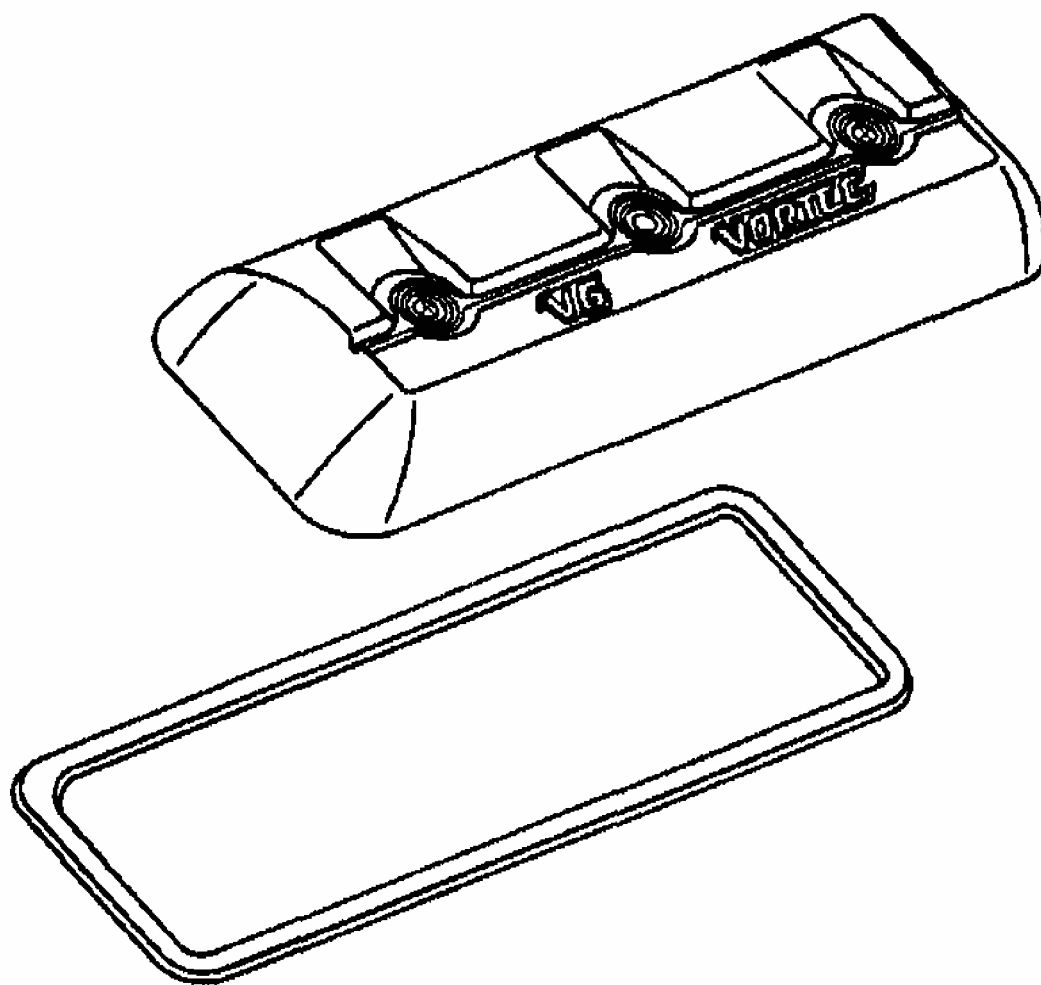
4. Remove the valve rocker arm cover.



G02502771

Fig. 37: Valve Rocker Arm Cover
Courtesy of GENERAL MOTORS CORP.

5. Remove the valve rocker arm cover gasket.
6. Discard the valve rocker arm cover gasket.

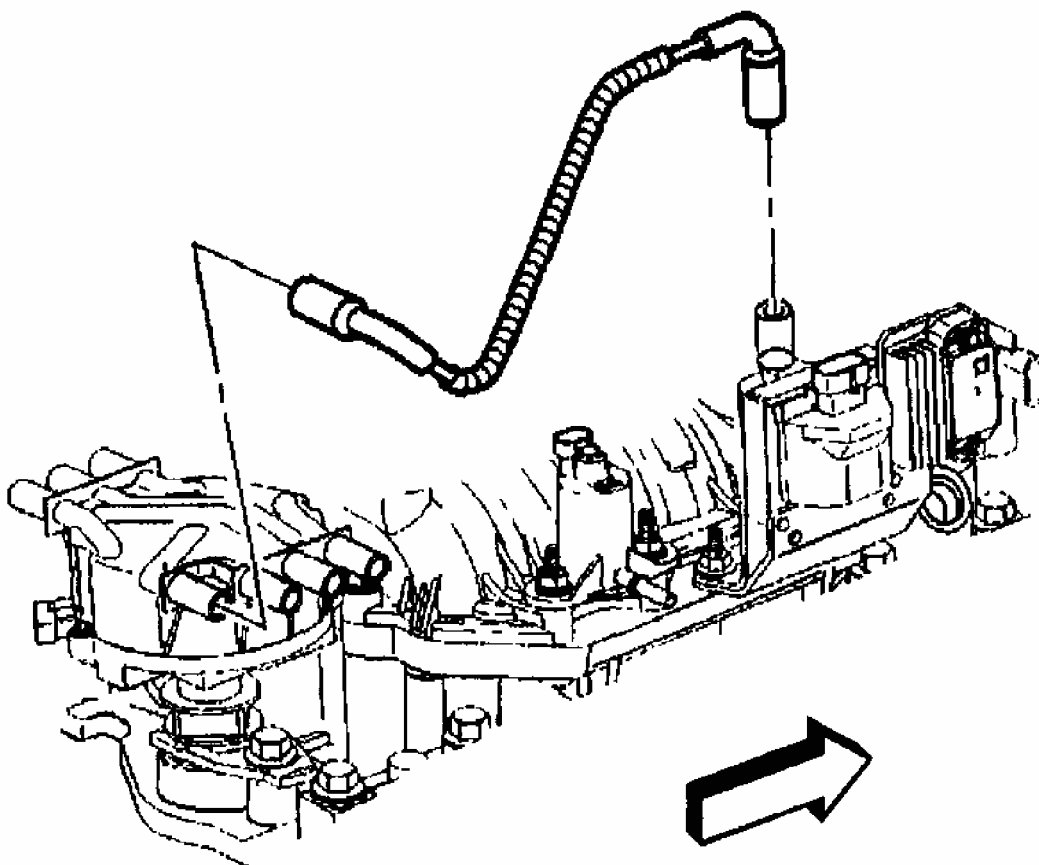


G02502772

Fig. 38: Valve Rocker Arm Cover Gasket
Courtesy of GENERAL MOTORS CORP.

DISTRIBUTOR REMOVAL

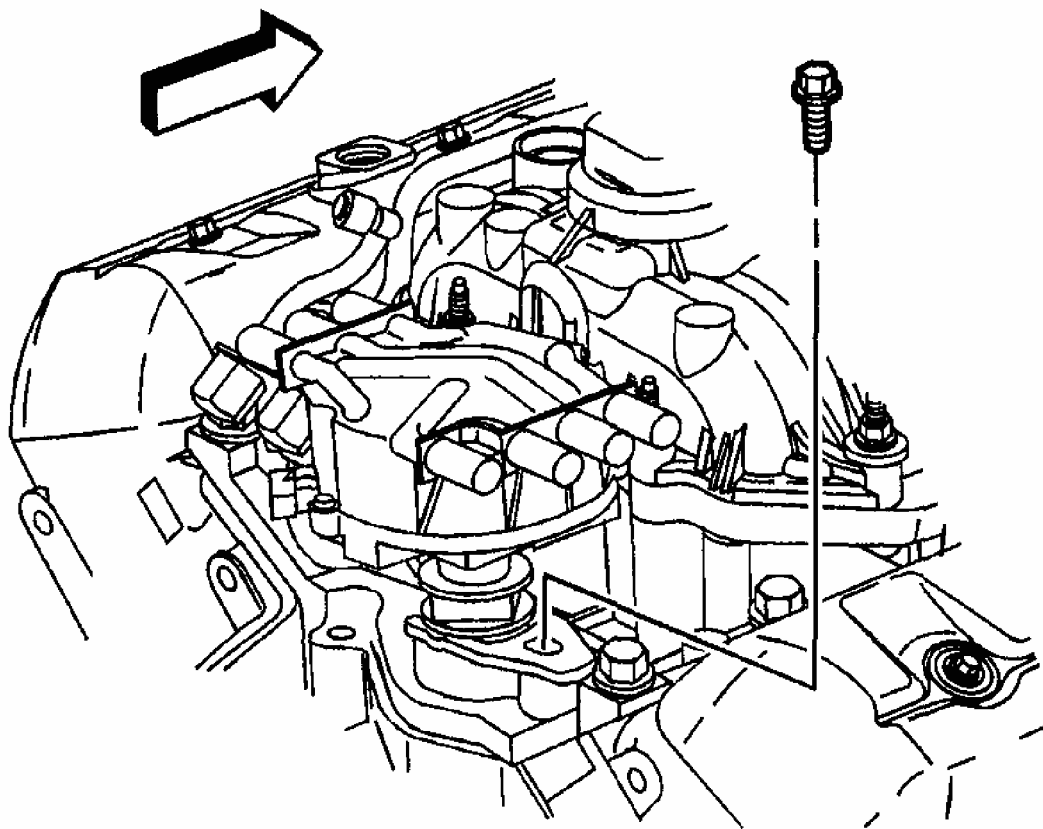
1. Remove the ignition coil wire harness from the ignition coil and distributor cap.



G02502773

Fig. 39: Ignition Coil Wire
Courtesy of GENERAL MOTORS CORP.

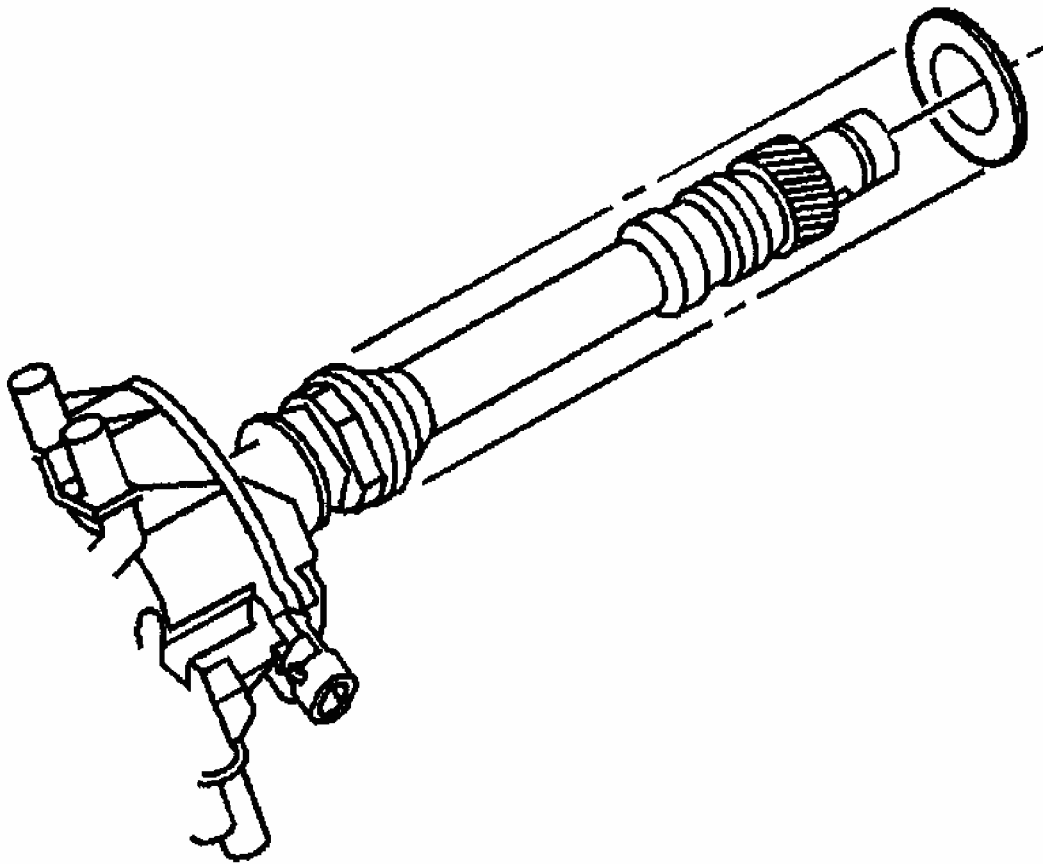
2. Remove the distributor clamp bolt.
3. Remove the distributor and the distributor clamp.



G02502774

Fig. 40: Distributor Clamp
Courtesy of GENERAL MOTORS CORP.

4. Remove the distributor gasket and discard.



G02502775

Fig. 41: Distributor Gasket
Courtesy of GENERAL MOTORS CORP.

INTAKE MANIFOLD REMOVAL

1. Remove the evaporative emission (EVAP) canister purge solenoid valve harness.
 - 1.1. Push the quick disconnect clip and hold in place.
 - 1.2. Pull outward on the harness elbow.

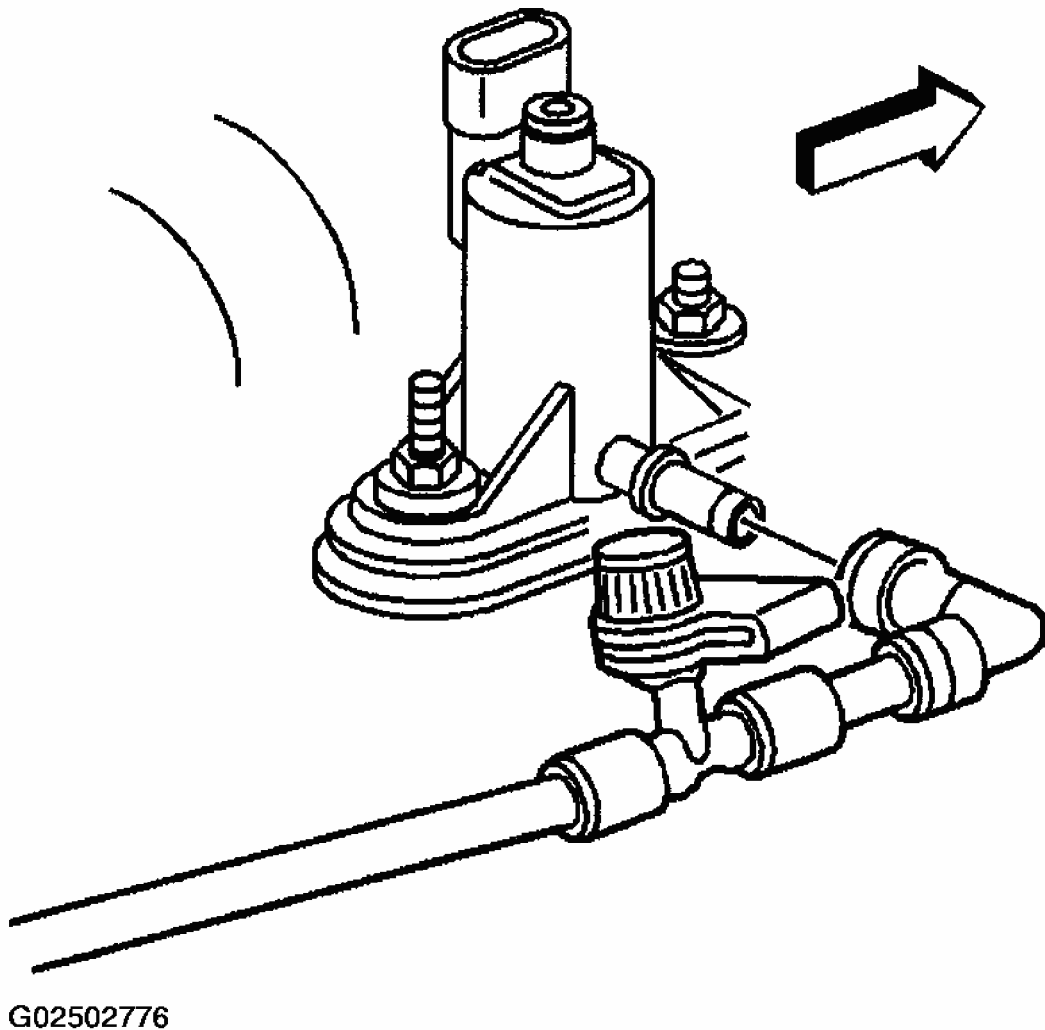


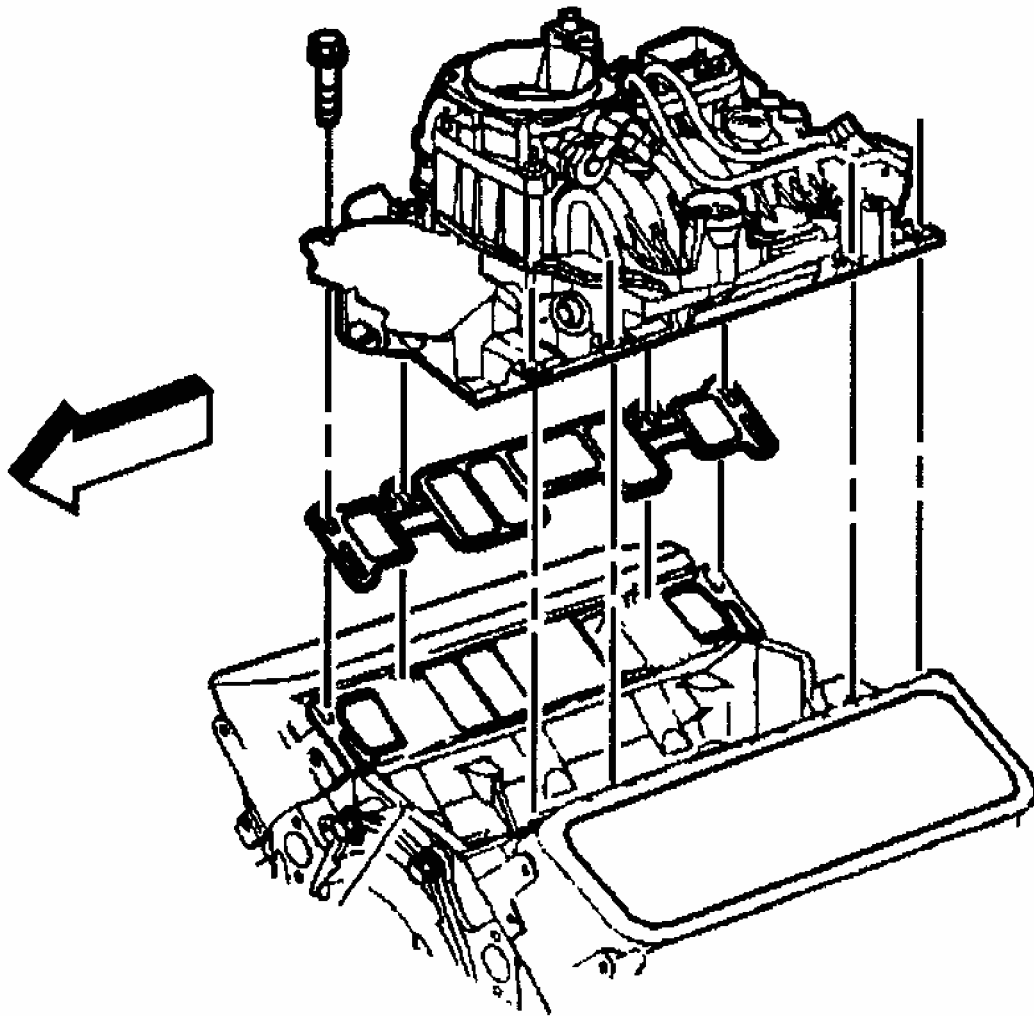
Fig. 42: EVAP Canister Purge Solenoid Valve
Courtesy of GENERAL MOTORS CORP.

2. Remove the engine coolant temperature (ECT) sensor wire connector, if equipped, from the engine wiring harness bracket.
3. Remove the lower intake manifold bolts.

Important:

- The intake manifold may be removed as an assembly. Do not remove the specific intake manifold components unless component service is required.
- Do not allow dirt or debris to enter the fuel system. Ensure that the ends of the fuel system are properly sealed.
- Do not disassemble the Central Sequential Fuel Injection (SFI) unit, unless

service is required.



G02502777

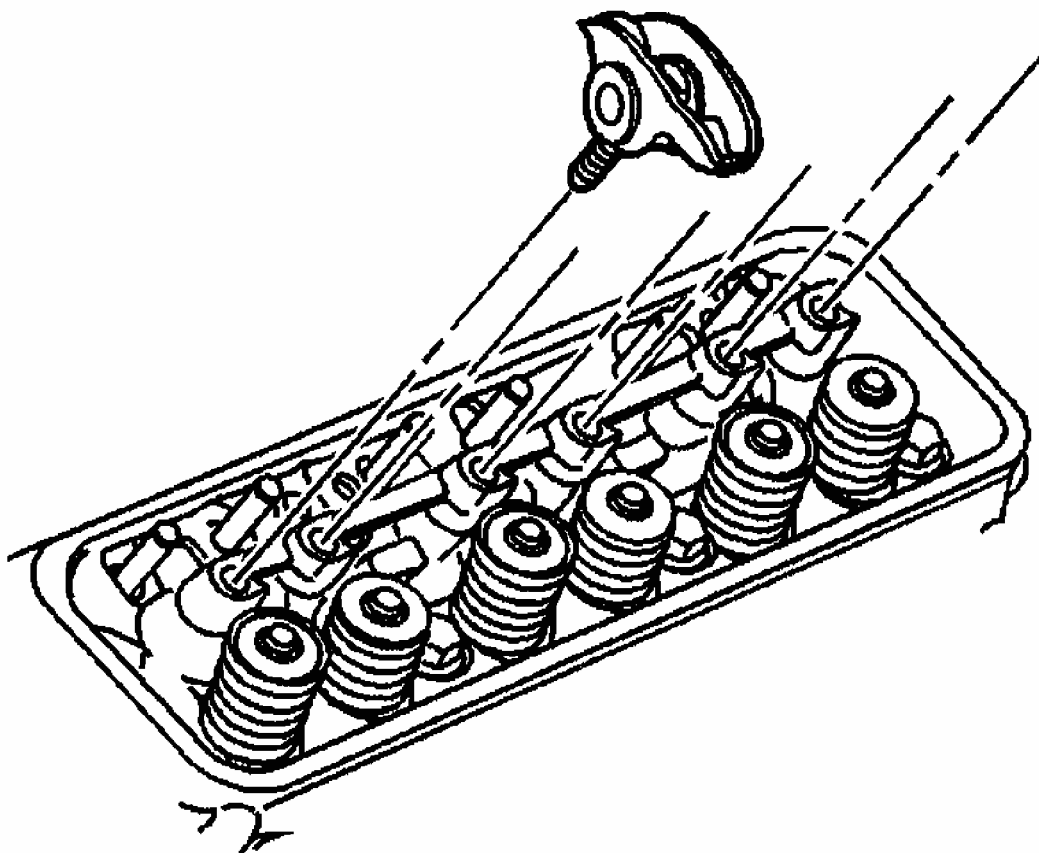
Fig. 43: Intake Manifold Assembly
Courtesy of GENERAL MOTORS CORP.

4. Remove the intake manifold assembly.

VALVE ROCKER ARM & PUSH ROD REMOVAL

Important: Mark, sort, and organize all the components for assembly.

1. Remove the valve rocker arms.

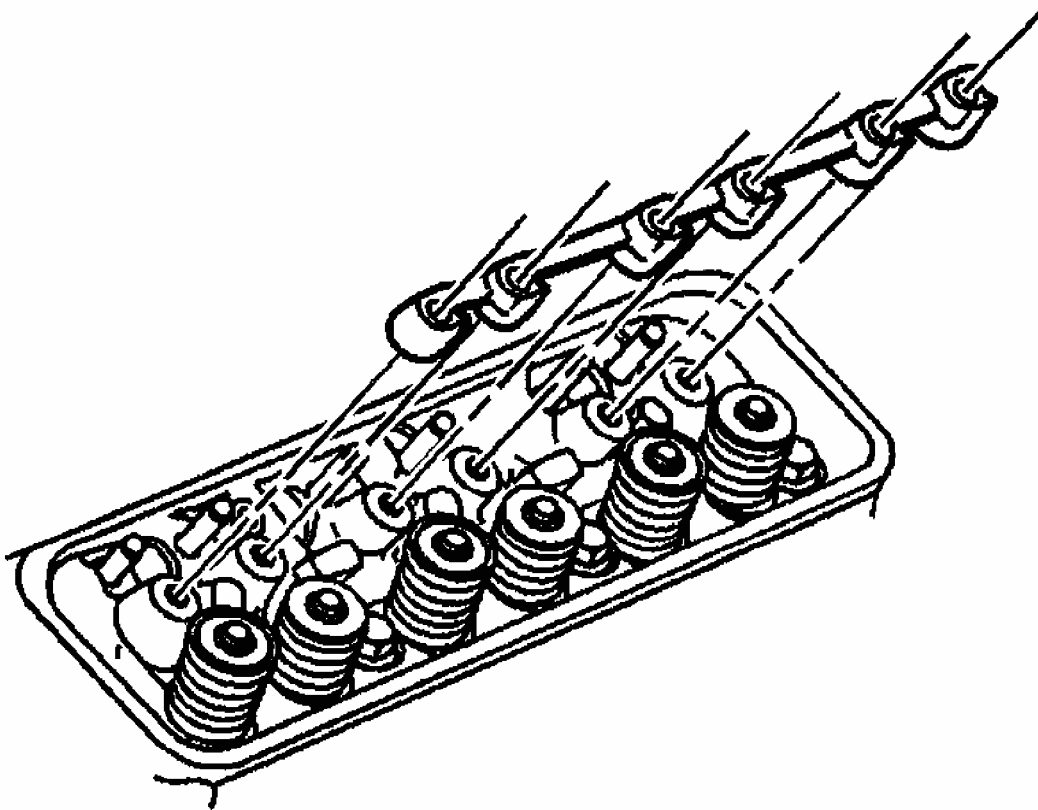


G02502778

Fig. 44: Rocker Arms

Courtesy of GENERAL MOTORS CORP.

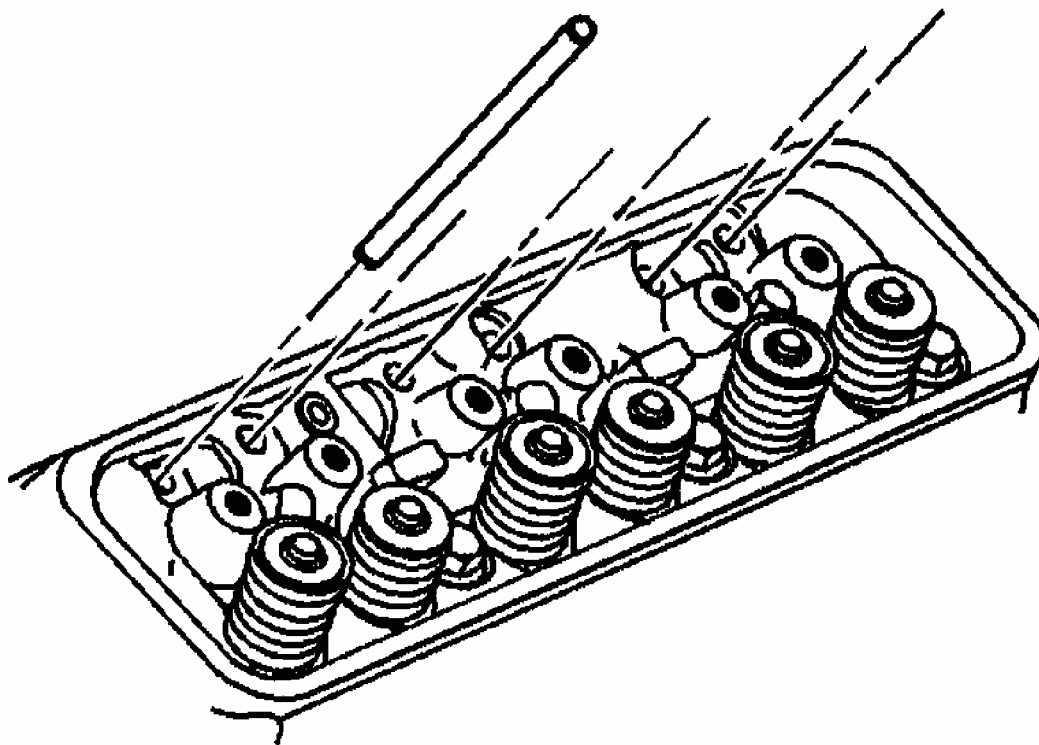
2. Remove the valve rocker arm supports.



G02502779

Fig. 45: Valve Rocker Arm Supports
Courtesy of GENERAL MOTORS CORP.

3. Remove the valve pushrods.

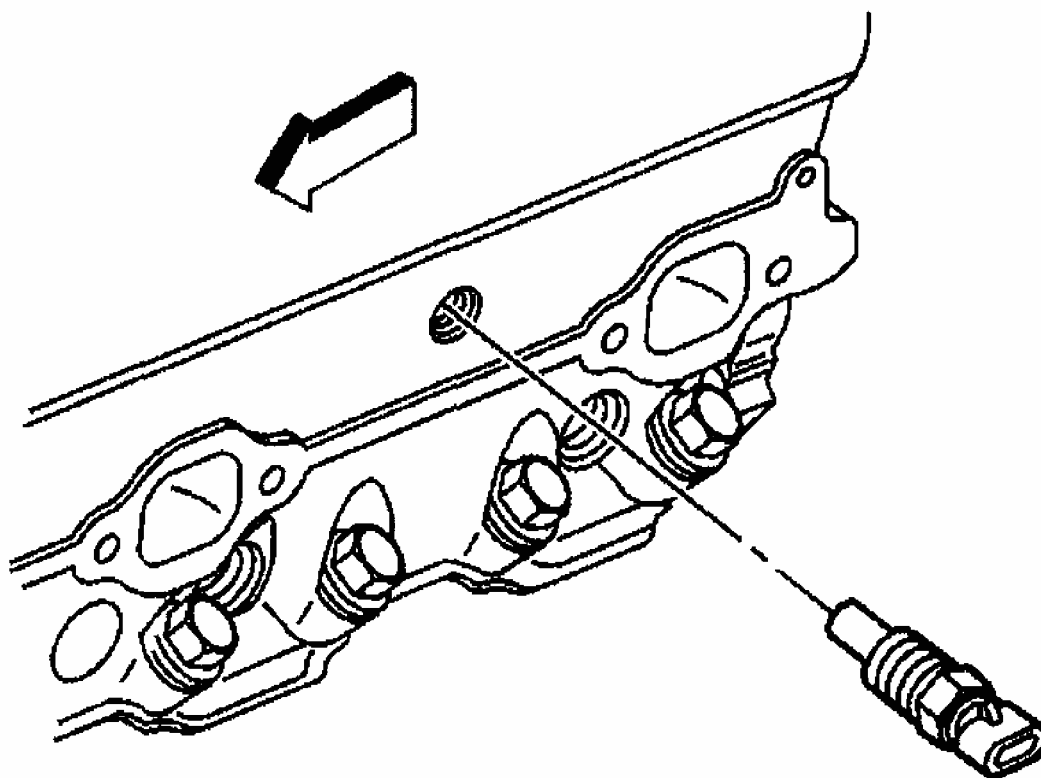


G02502780

Fig. 46: Valve Pushrods
Courtesy of GENERAL MOTORS CORP.

CYLINDER HEAD REMOVAL - LEFT

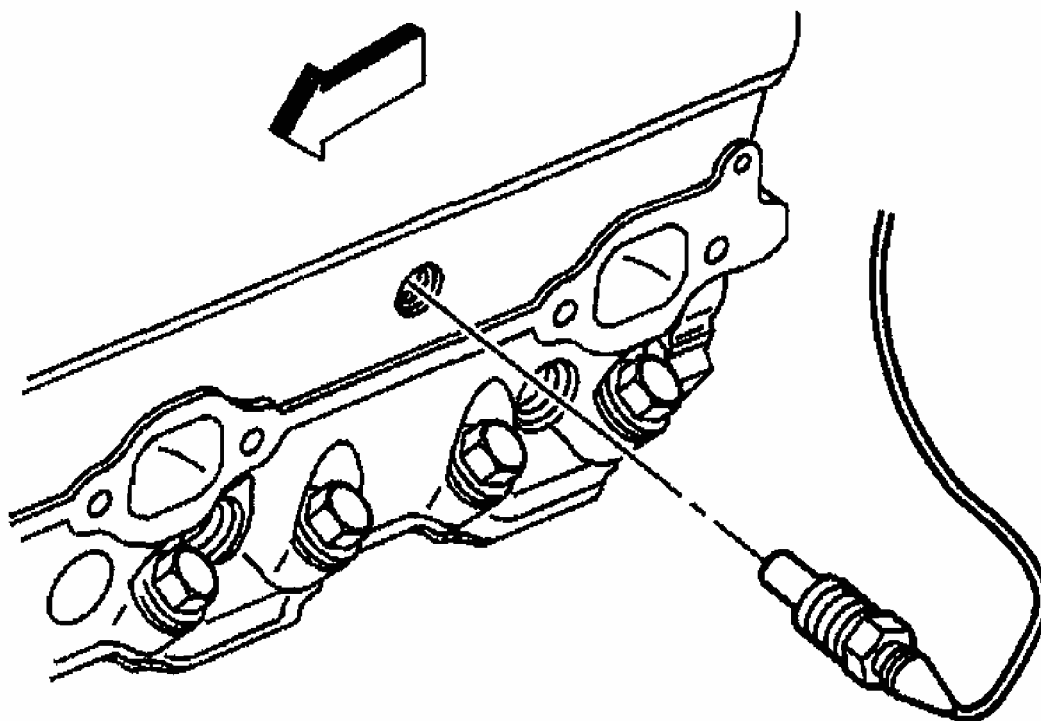
1. Remove the engine coolant temperature sensor, if applicable.



G02502781

Fig. 47: Engine Coolant Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

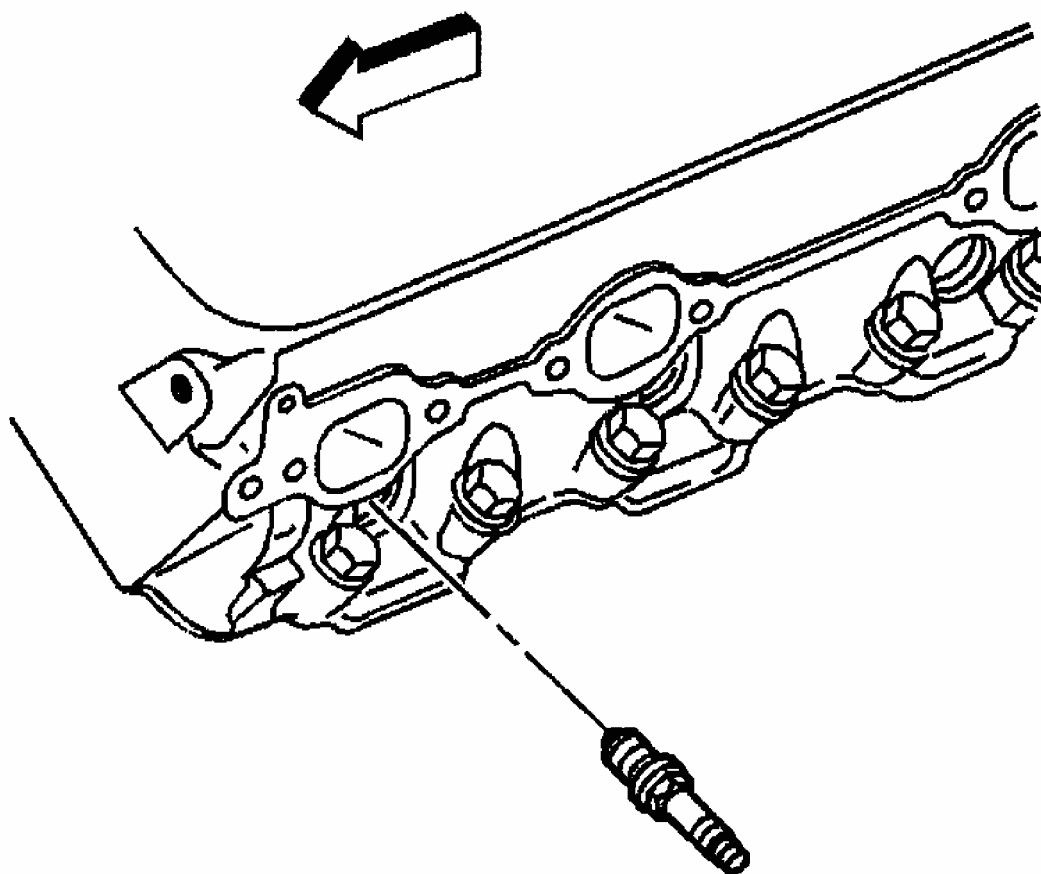
2. Remove the engine coolant temperature gage sensor, if applicable.



G02502782

Fig. 48: Engine Coolant Temperature Gage Sensor
Courtesy of GENERAL MOTORS CORP.

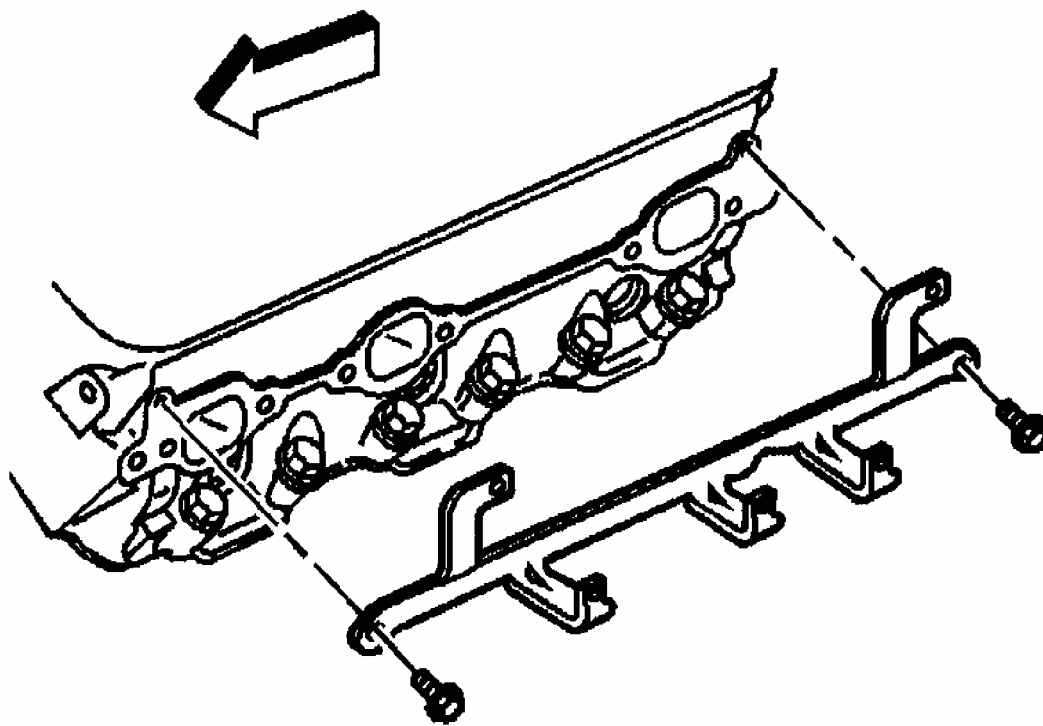
3. Remove the spark plugs.



G02502783

Fig. 49: Spark Plug
Courtesy of GENERAL MOTORS CORP.

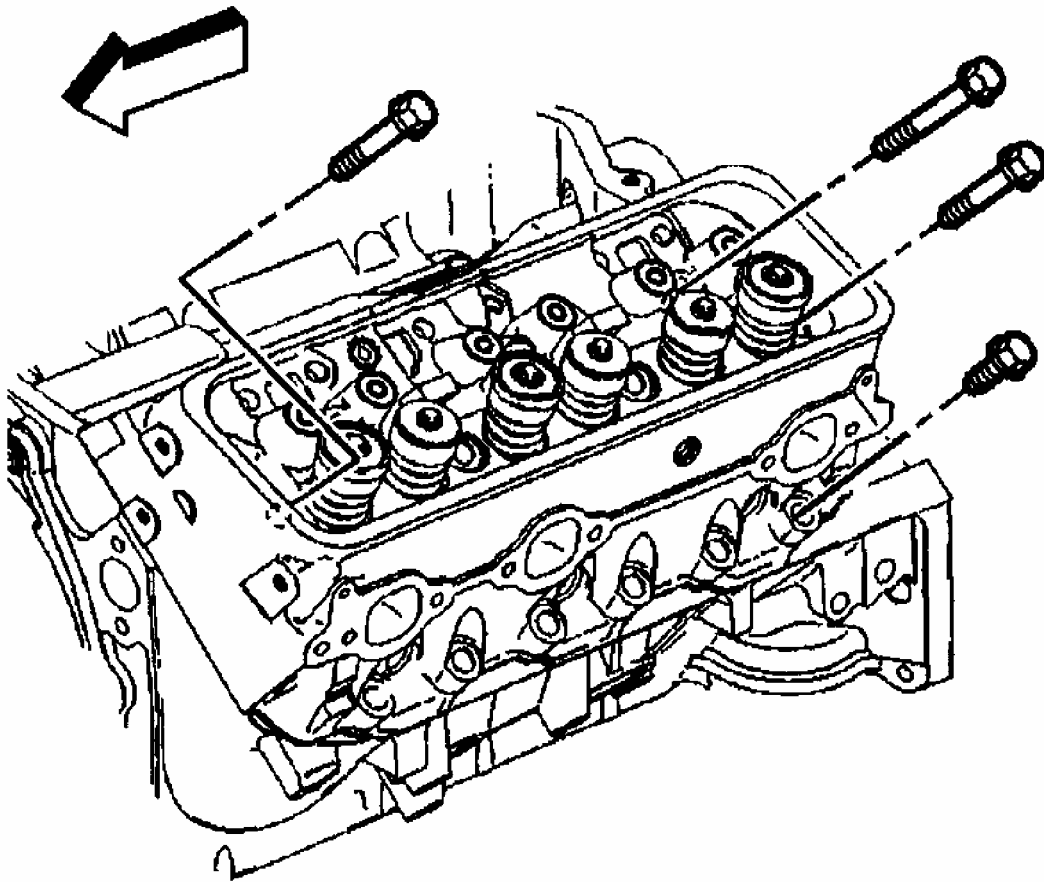
4. Remove the bolts and the spark plug wire support.



G02502784

Fig. 50: Spark Plug Wire Support
Courtesy of GENERAL MOTORS CORP.

5. Remove the cylinder head bolts.

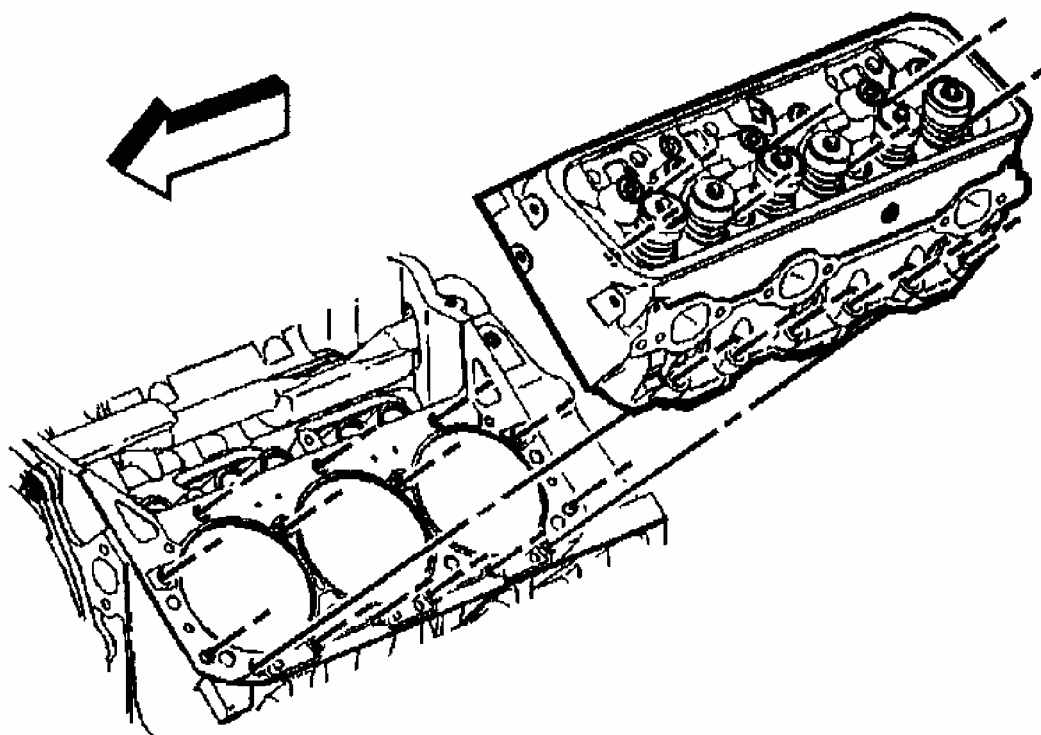


G02502785

Fig. 51: Cylinder Head Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: After removal, place the cylinder head on two wood blocks to prevent damage.

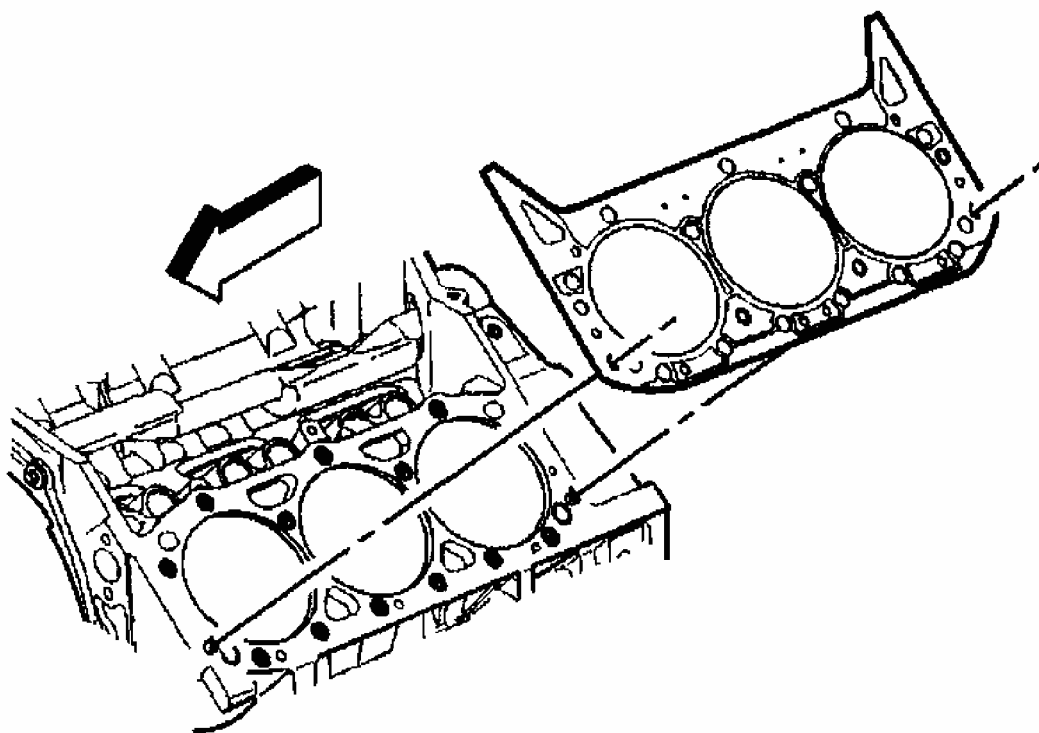
6. Remove the cylinder head.



G02502786

Fig. 52: Cylinder Head
Courtesy of GENERAL MOTORS CORP.

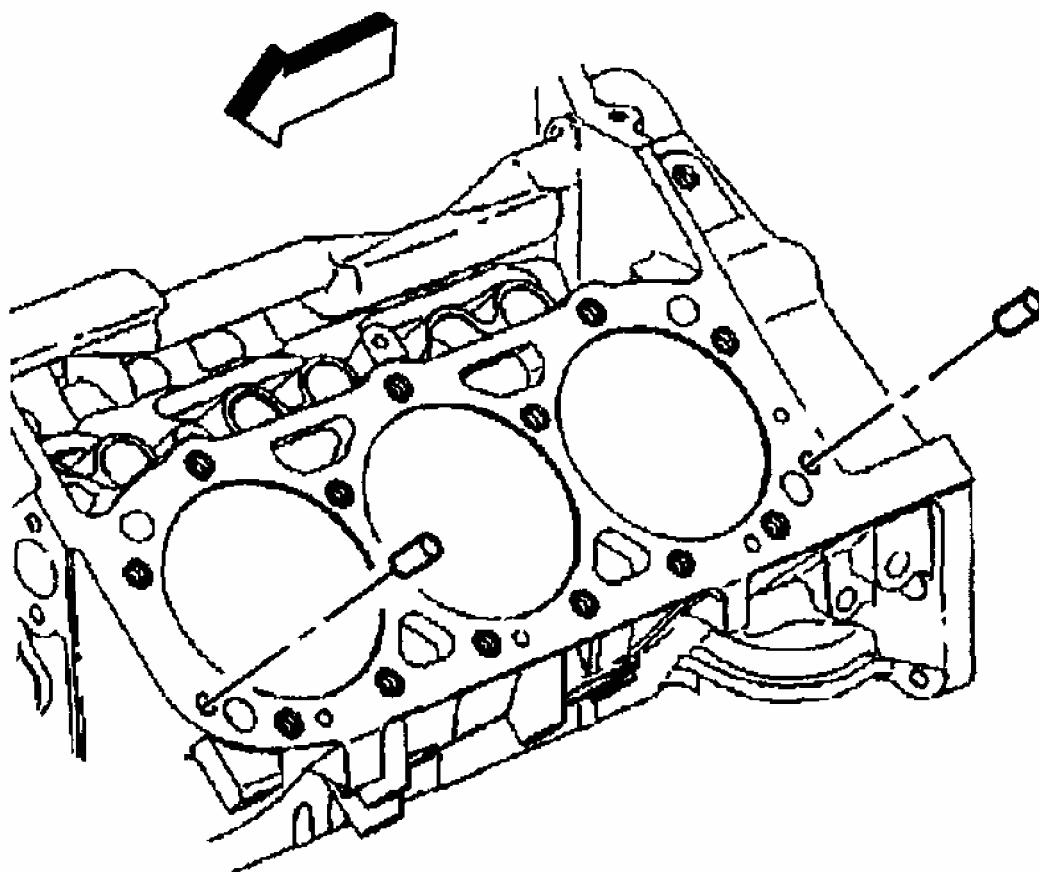
7. Remove and discard the cylinder head gasket.



G02502787

Fig. 53: Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

8. Remove the cylinder head locator dowel pins, if required.

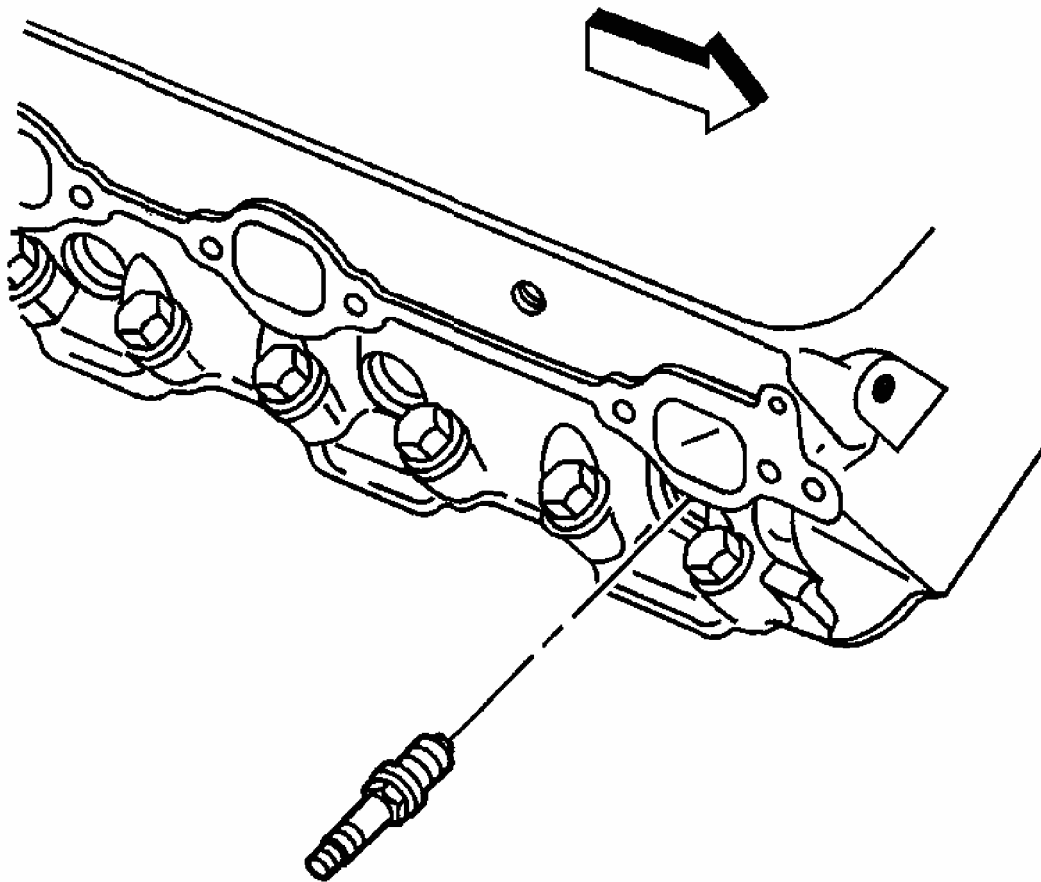


G02502788

Fig. 54: Cylinder Head Locator Dowel Pins
Courtesy of GENERAL MOTORS CORP.

CYLINDER HEAD REMOVAL - RIGHT

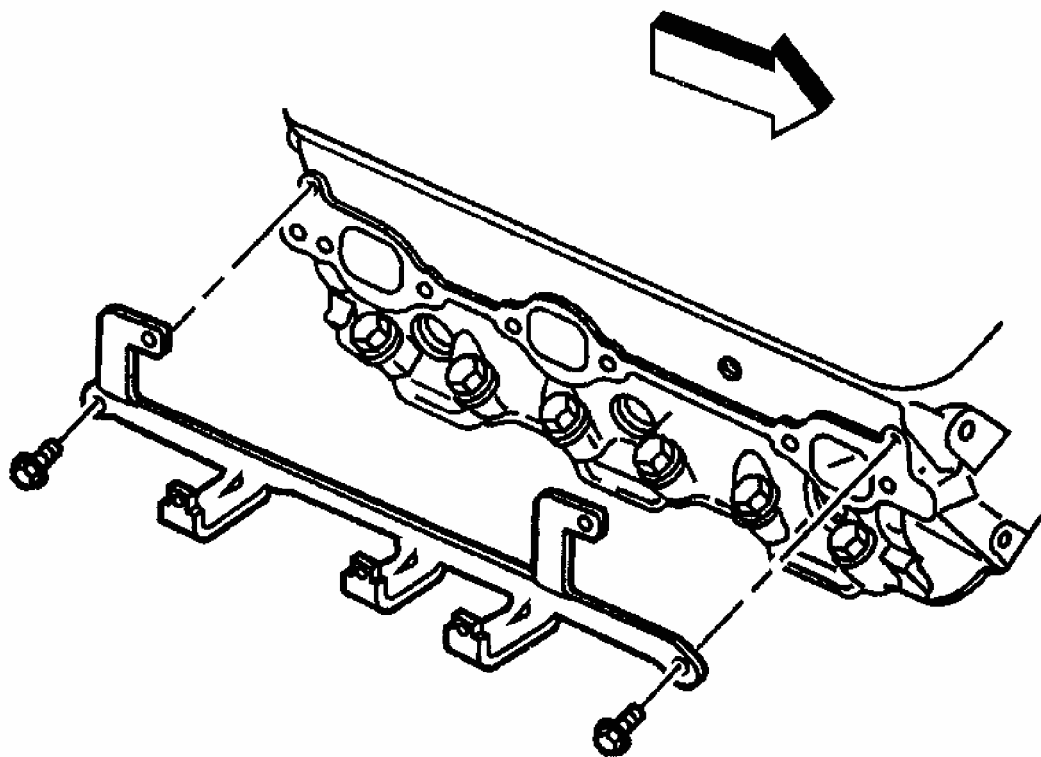
1. Remove the spark plugs.



G02502789

Fig. 55: Spark Plug
Courtesy of GENERAL MOTORS CORP.

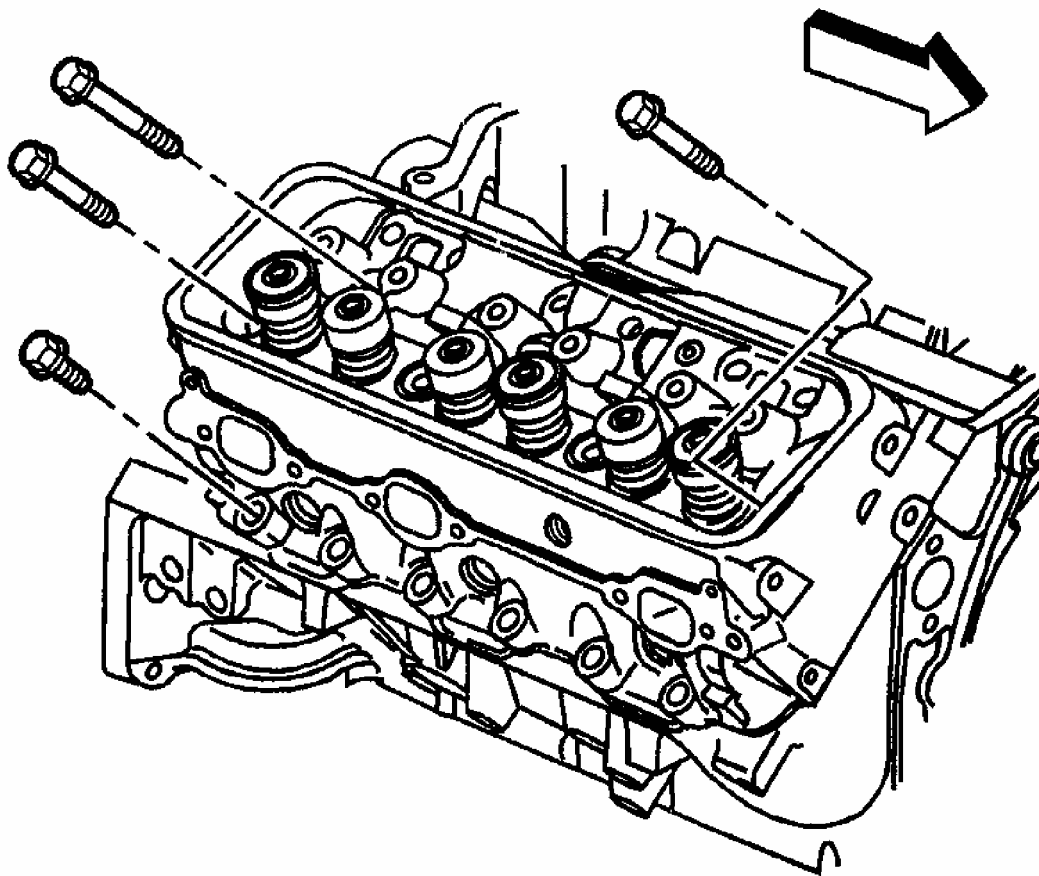
2. Remove the rear bolt and the spark plug wire support.



G02502790

Fig. 56: Spark Plug Wire Support
Courtesy of GENERAL MOTORS CORP.

3. Remove the cylinder head bolts.

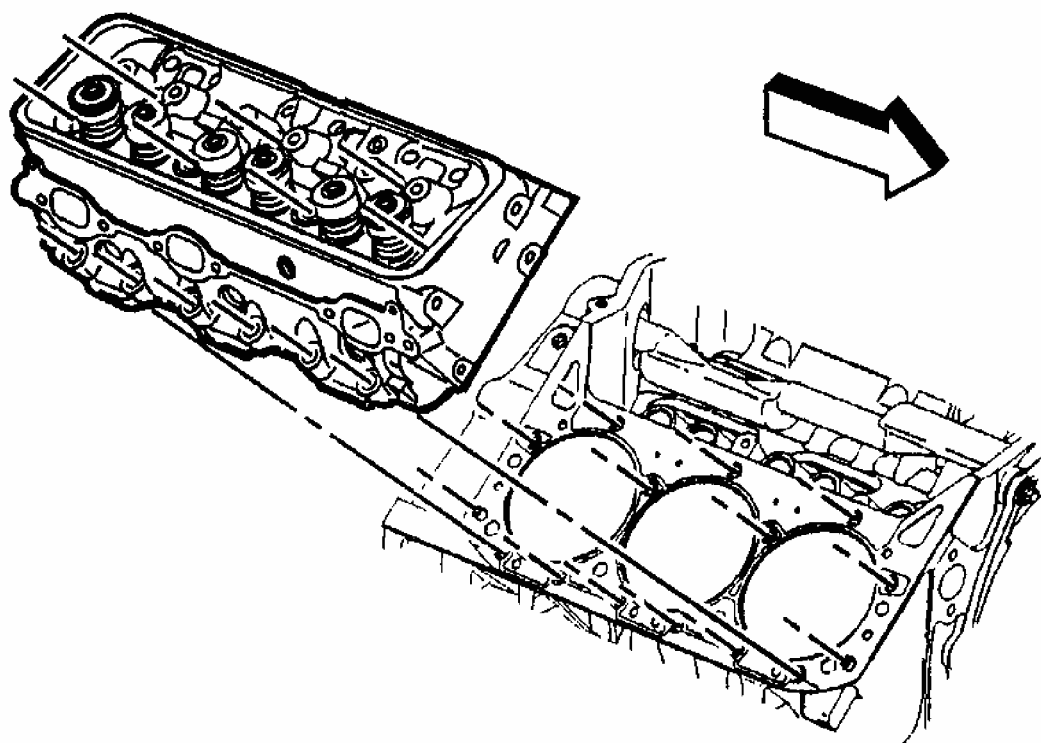


G02502791

Fig. 57: Cylinder Head Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: After removal, place the cylinder head on two wood blocks to prevent damage.

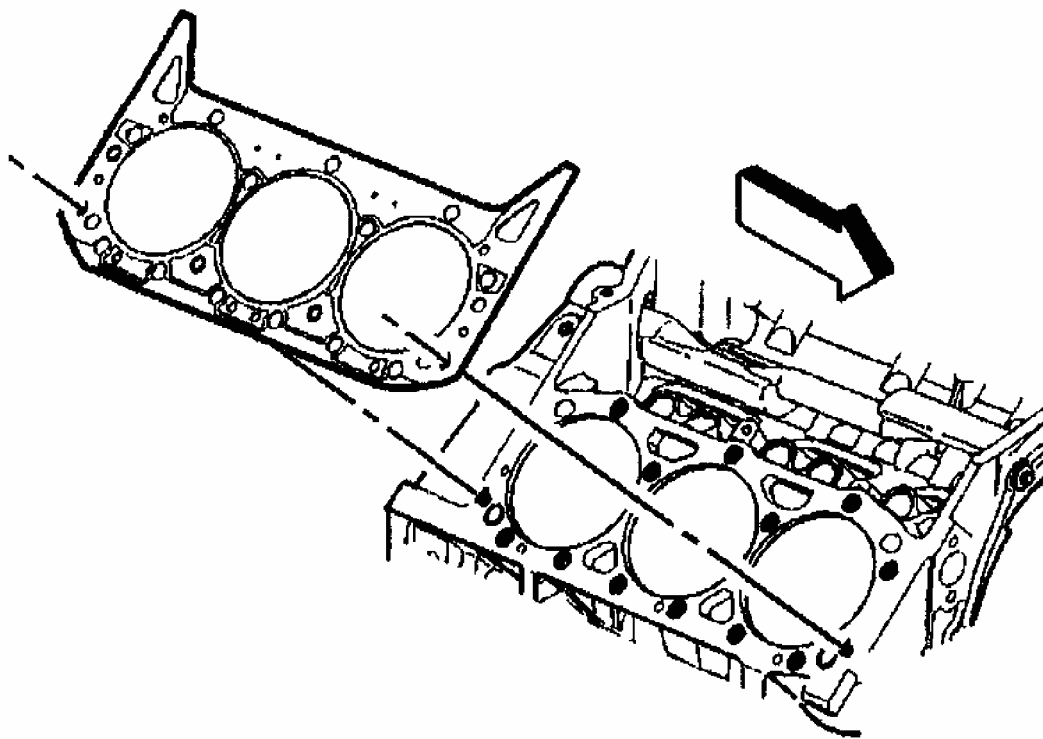
4. Remove the cylinder head.



G02502792

Fig. 58: Cylinder Head
Courtesy of GENERAL MOTORS CORP.

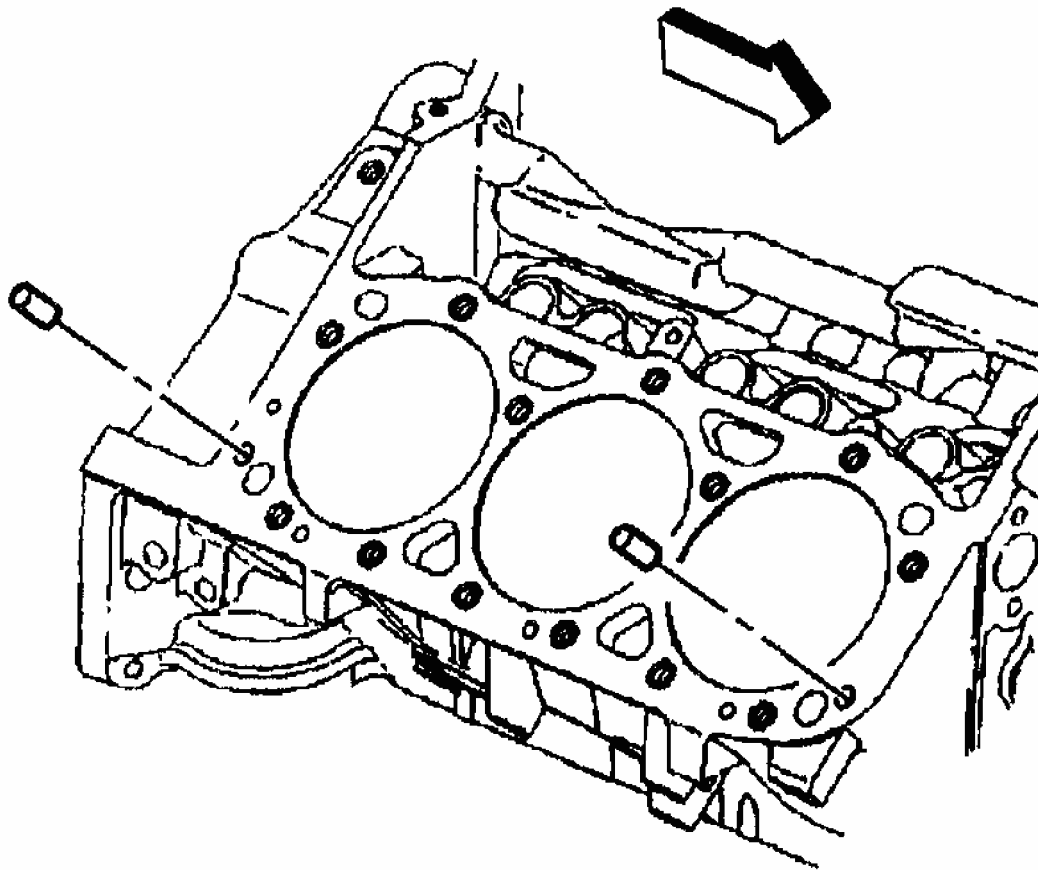
5. Remove and discard the cylinder head gasket.



G02502793

Fig. 59: Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

6. Remove the cylinder head locator dowel pins, if required.



G02502794

Fig. 60: Cylinder Head Locator Dowel Pins
Courtesy of GENERAL MOTORS CORP.

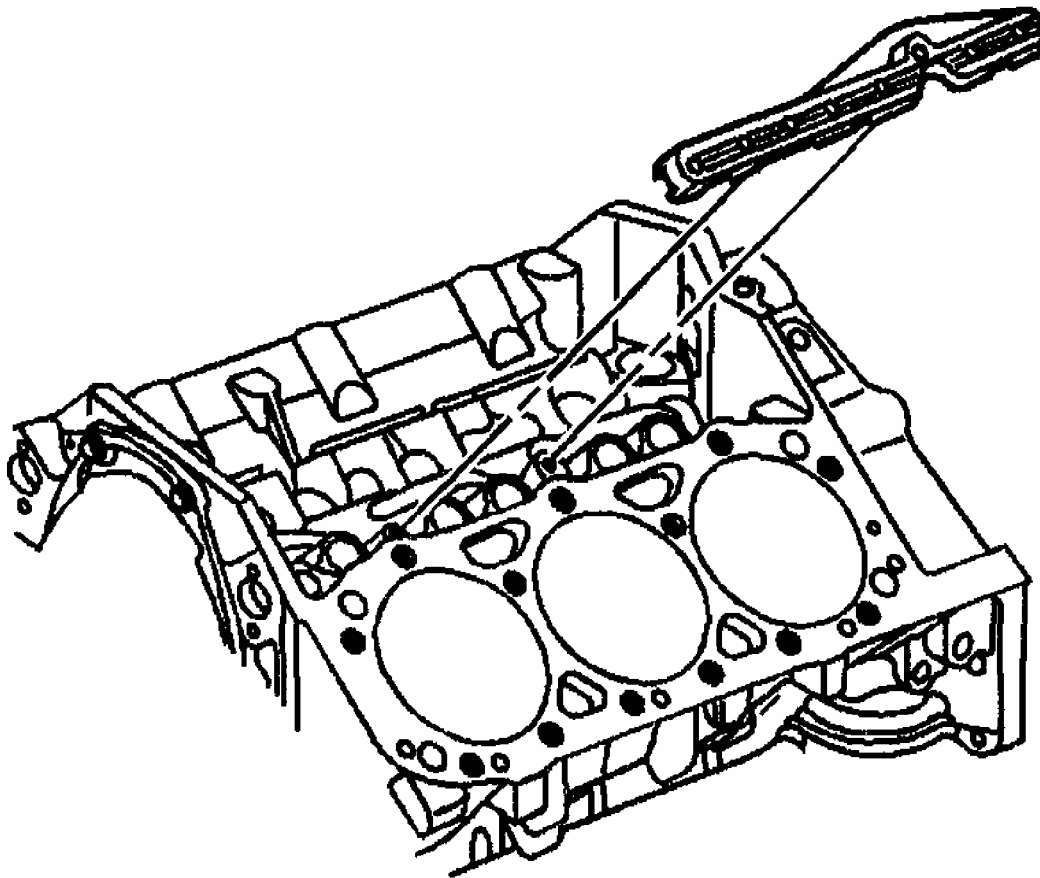
VALVE LIFTER REMOVAL

Tools Required

J 3049-A Valve Lifter Remover

Important: Place the components in a rack so that the components can be reinstalled to their original location.

1. Remove the bolts and valve lifter pushrod guide.

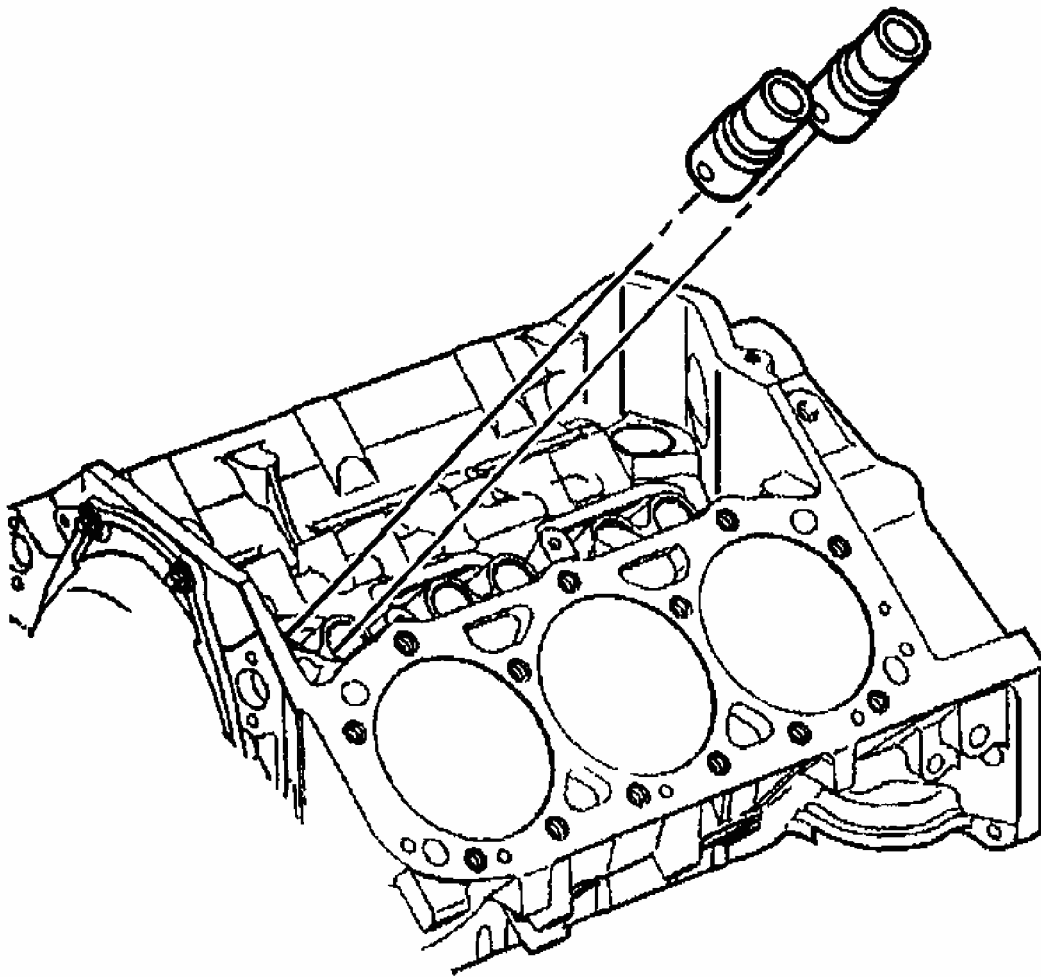


G02502795

Fig. 61: Valve Lifter Pushrod Guide
Courtesy of GENERAL MOTORS CORP.

Important: Place the valve lifters in the rack in the upright position in order to maintain the oil inside the valve lifters.

2. Remove the valve lifters.



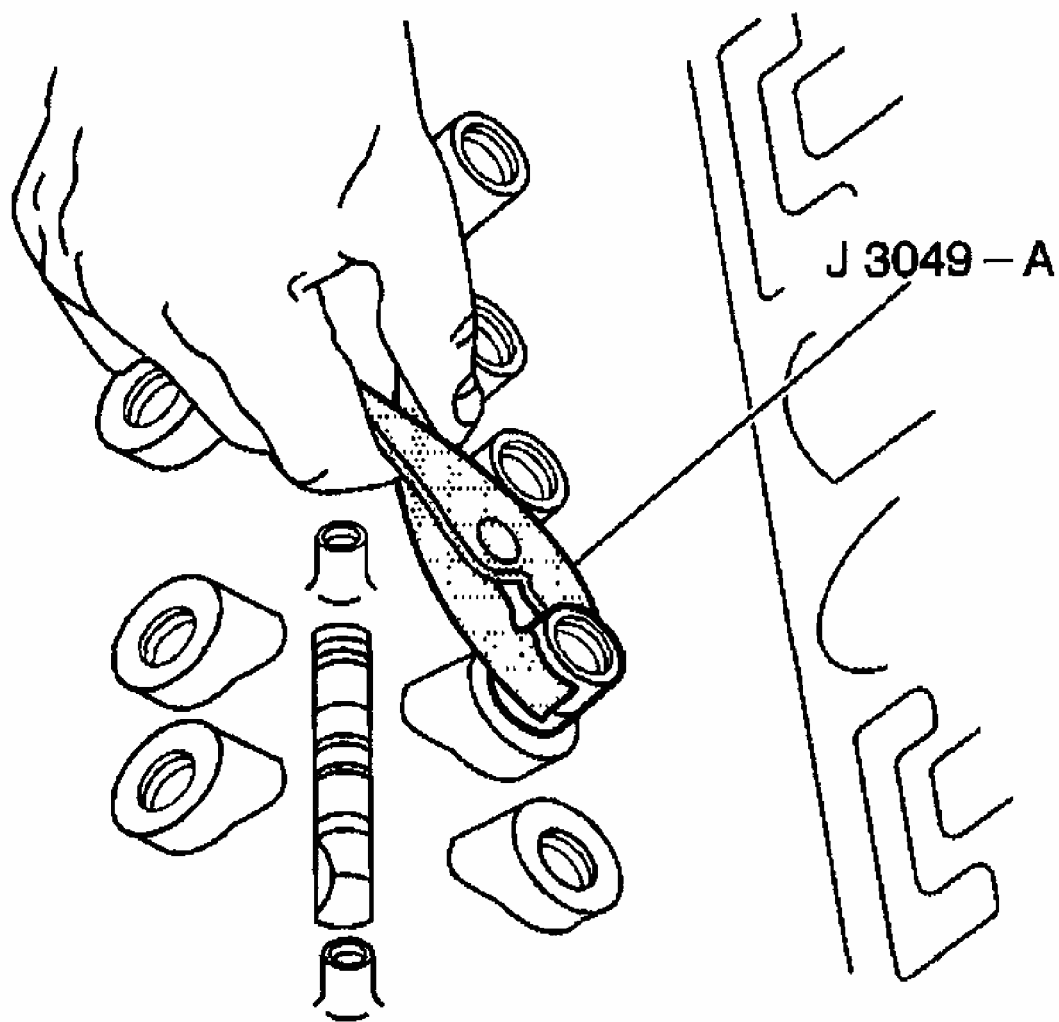
G02502796

Fig. 62: Valve Lifters

Courtesy of GENERAL MOTORS CORP.

Important: Some valve lifters may be stuck in the valve lifter bores because of gum or varnish deposits and may require the use of **J 3049-A** for removal.

3. Use the **J 3049-A** in order to remove the stuck valve lifters.



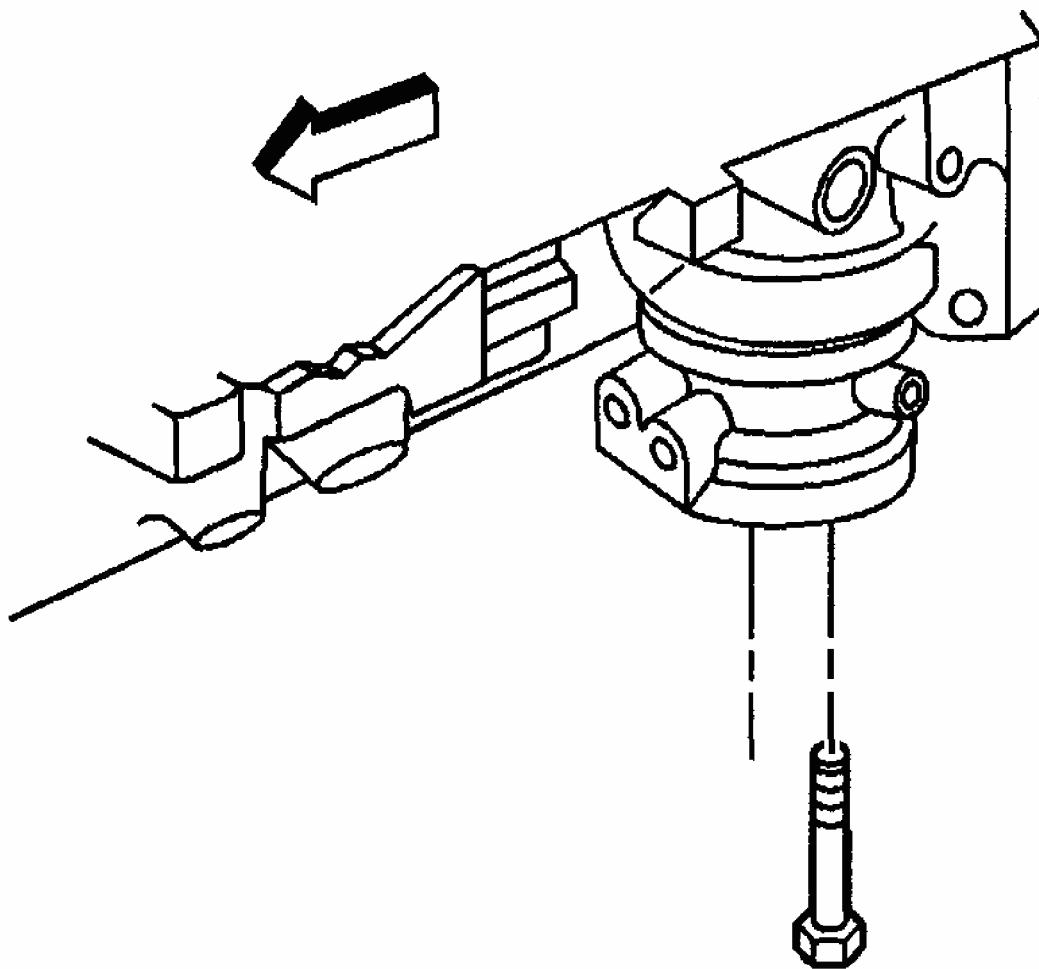
G02502797

Fig. 63: Valve Lifters

Courtesy of GENERAL MOTORS CORP.

OIL FILTER ADAPTER REMOVAL

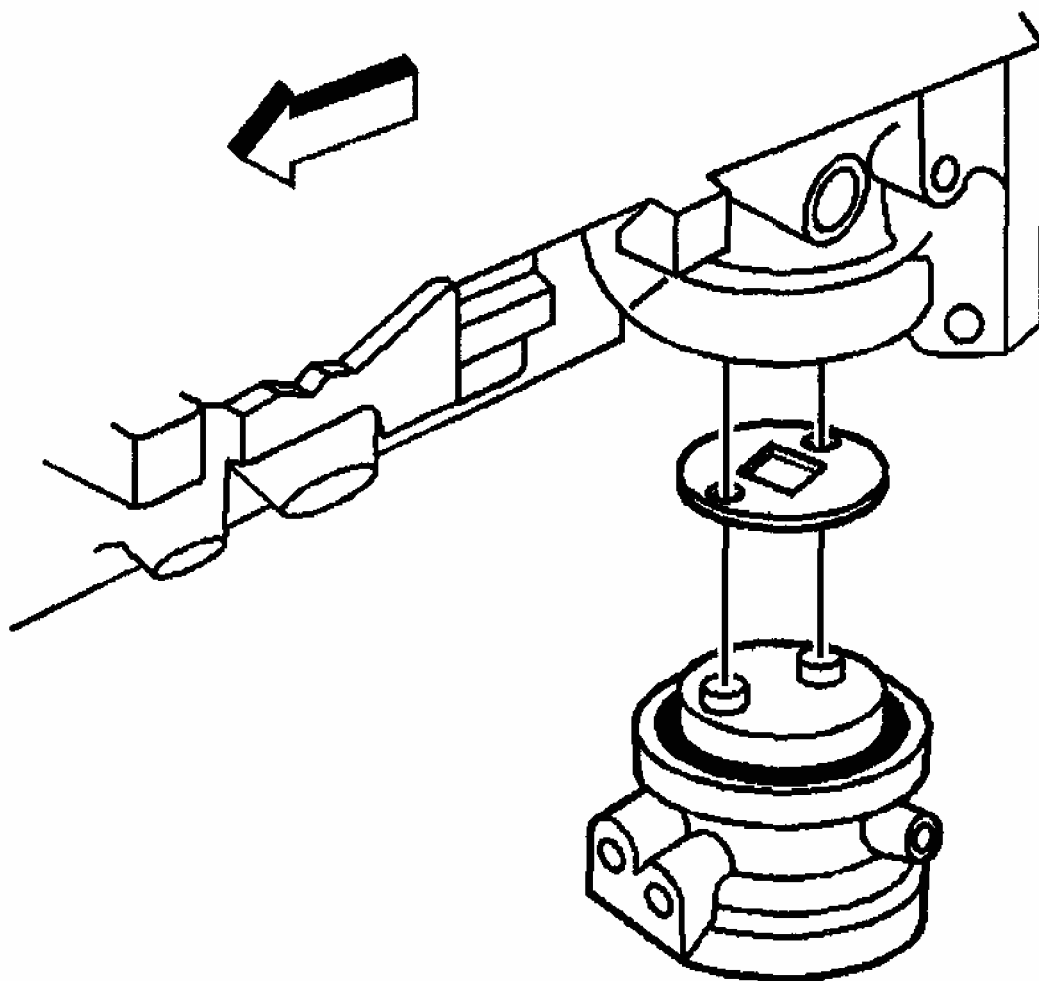
1. Remove the oil filter adapter bolts.



G02502798

Fig. 64: Oil Filter Adapter Bolts
Courtesy of GENERAL MOTORS CORP.

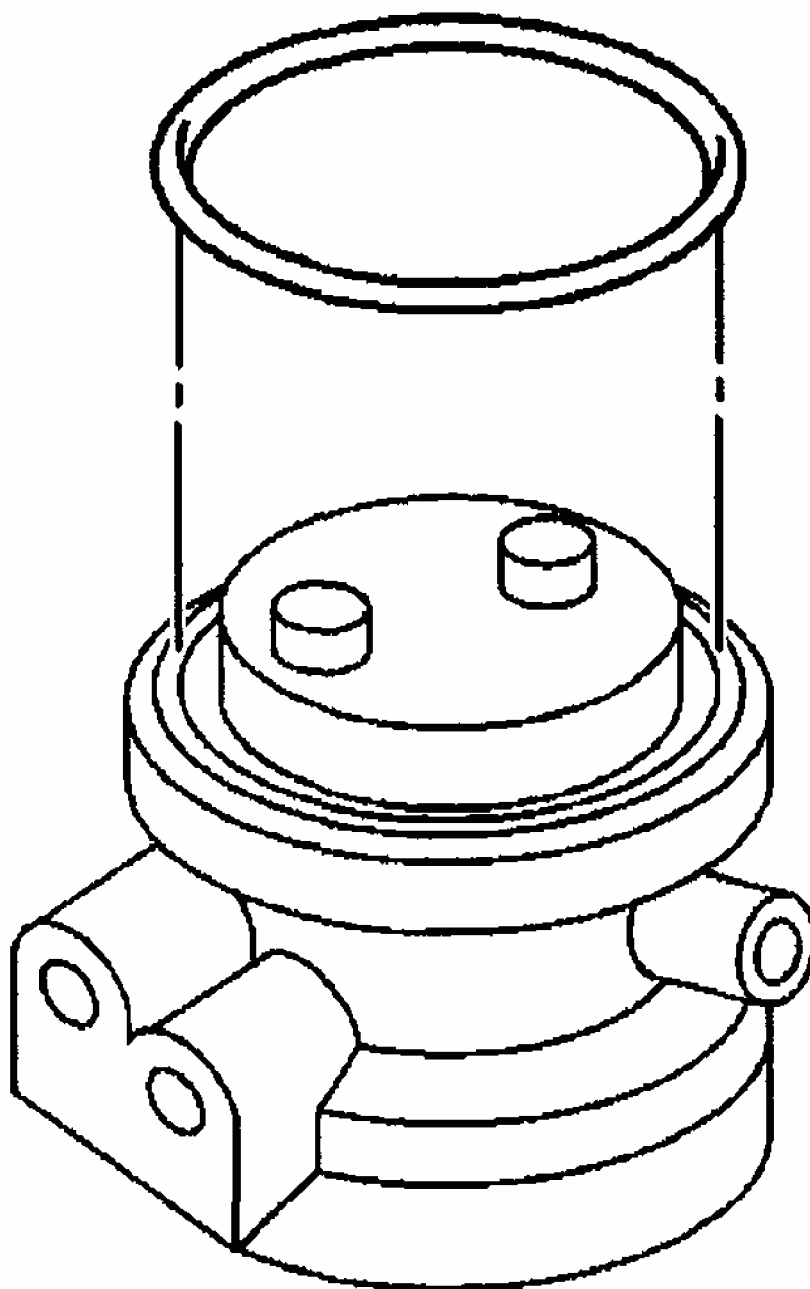
2. Remove the oil filter adapter and the oil filter adapter gasket.
3. Discard the oil filter adapter gasket.



G02502799

Fig. 65: Oil Filter Adapter Gasket
Courtesy of GENERAL MOTORS CORP.

4. Remove the oil filter adapter seal (O-ring).
5. Discard the oil filter adapter seal (O-ring).

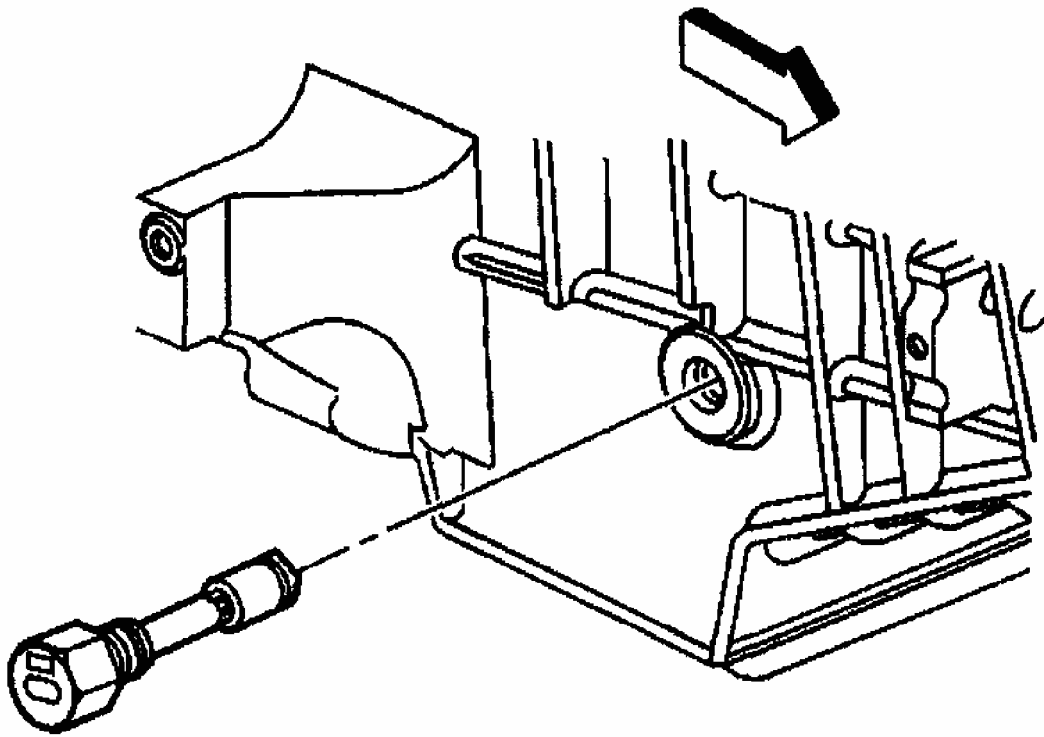


G02502800

Fig. 66: Oil Filter Adapter Seal (O-Ring)
Courtesy of GENERAL MOTORS CORP.

OIL PAN REMOVAL

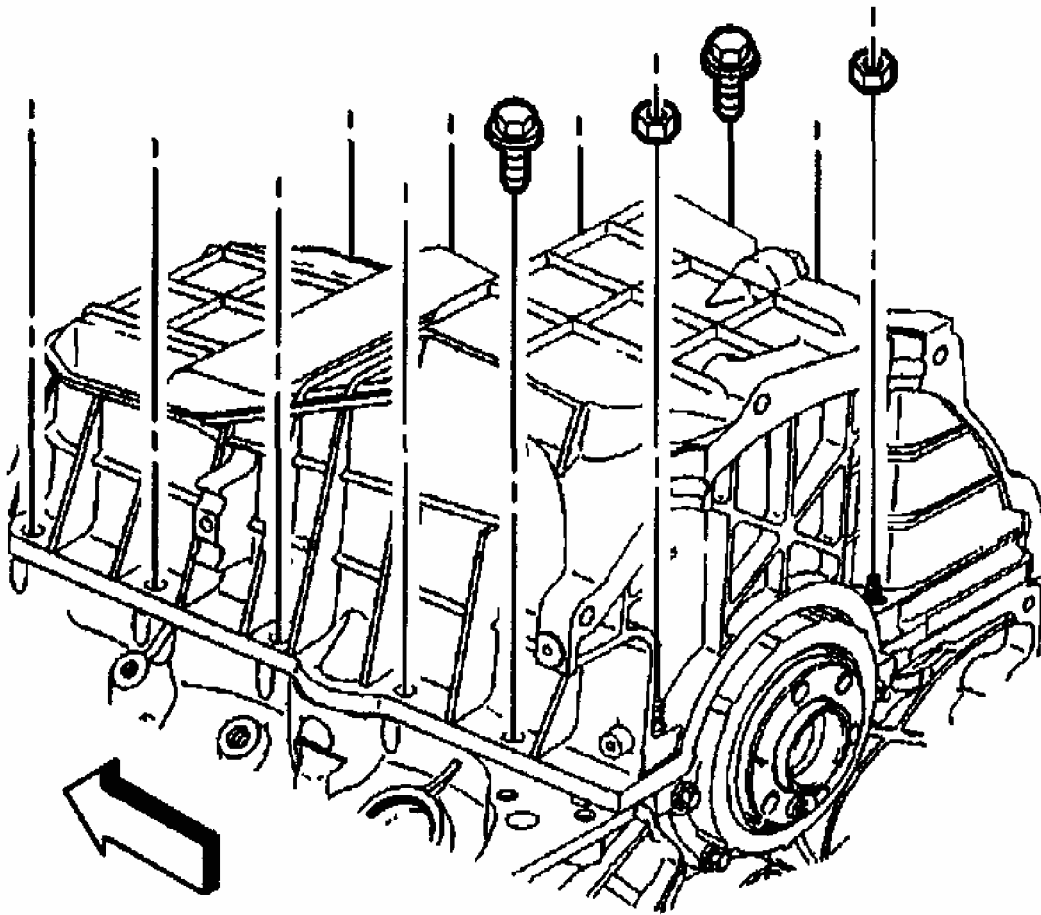
1. Remove and discard the engine oil level sensor, if applicable.



G02502801

Fig. 67: Engine Oil Level Sensor
Courtesy of GENERAL MOTORS CORP.

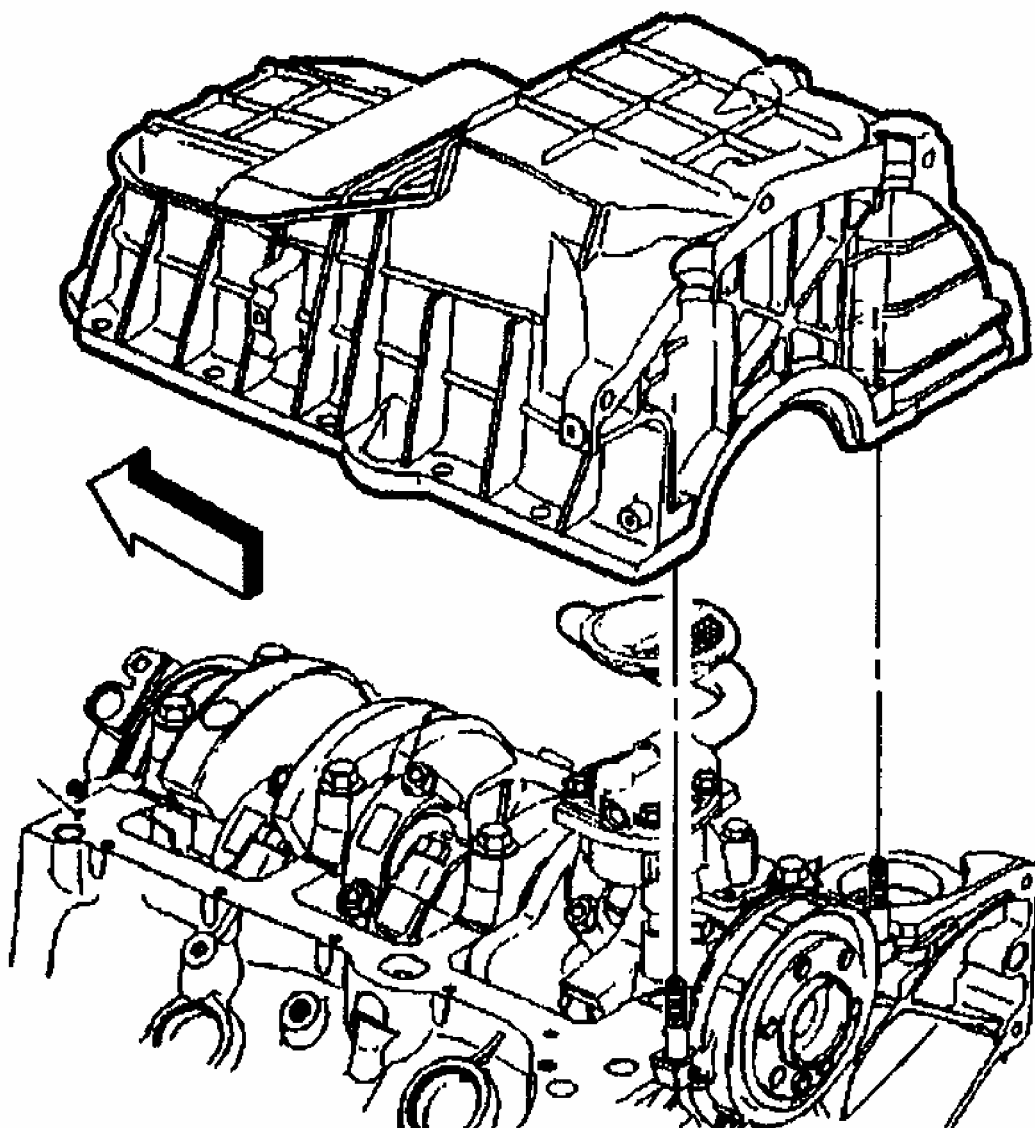
2. Remove the oil pan bolts and nuts.



G02502802

Fig. 68: Oil Pan Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

3. Remove the oil pan.

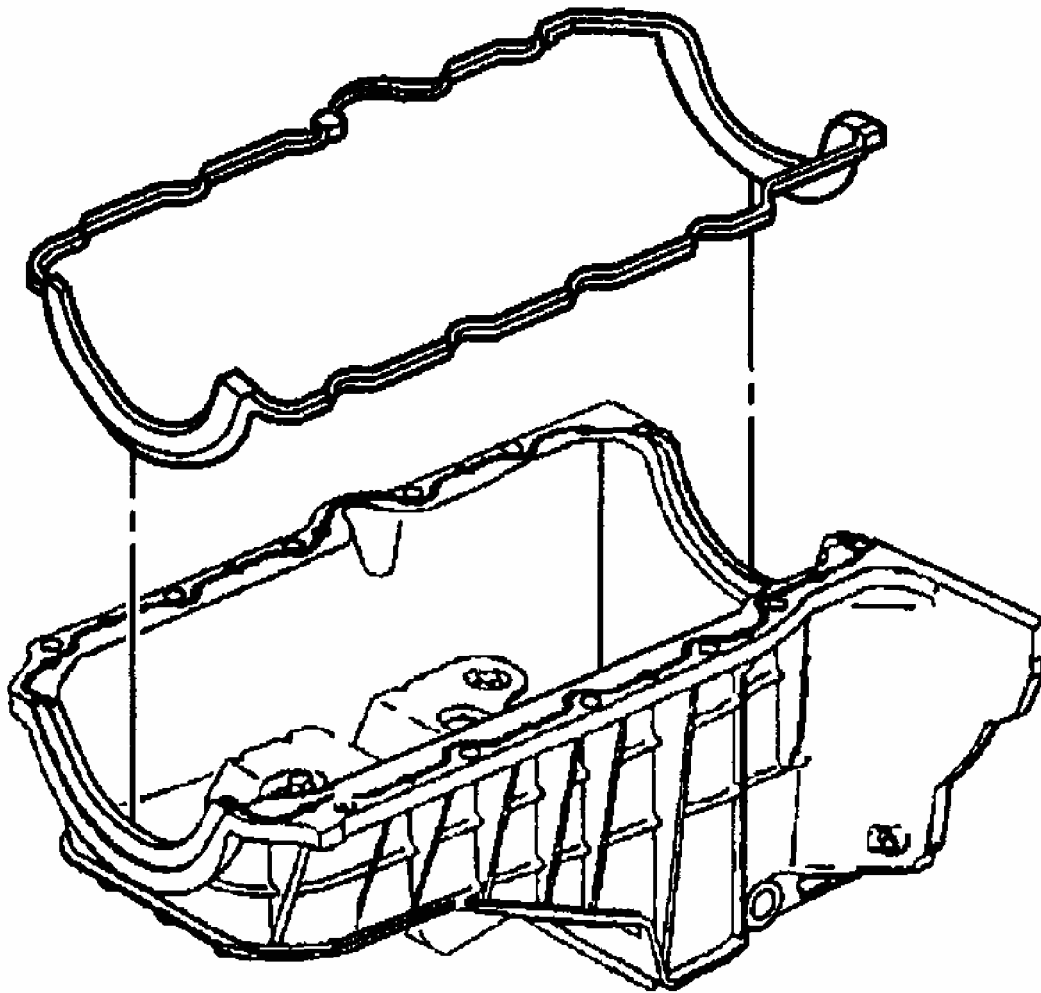


G02502803

Fig. 69: Oil Pan

Courtesy of GENERAL MOTORS CORP.

4. Remove the oil pan gasket.
5. Discard the oil pan gasket.

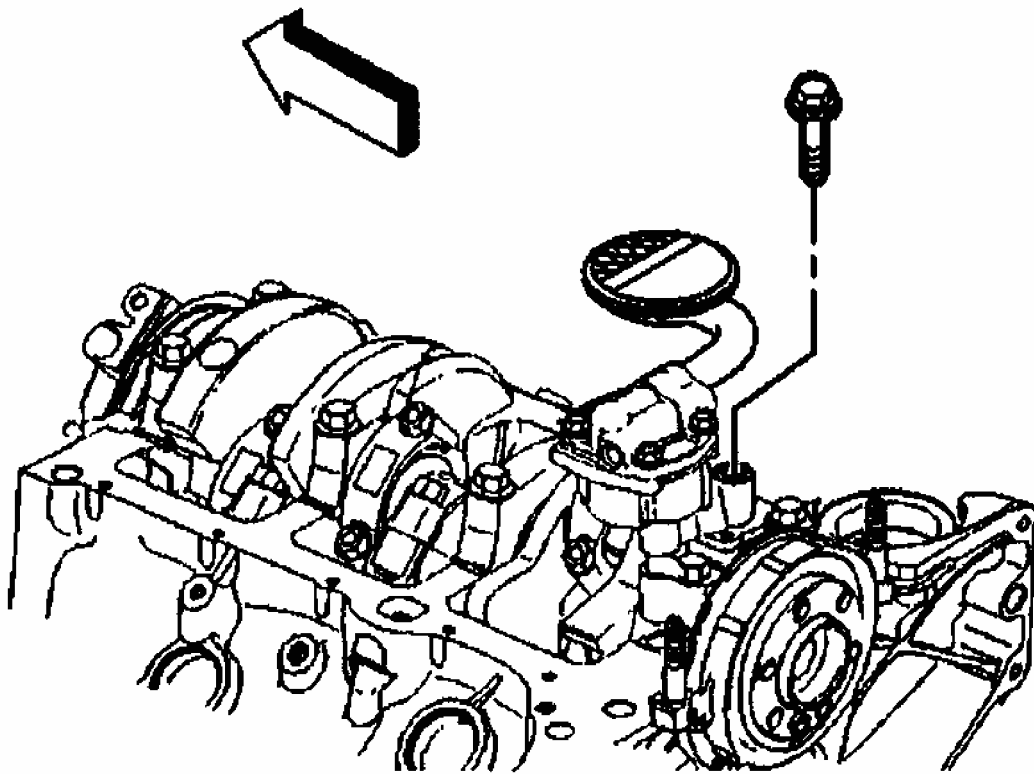


G02502804

Fig. 70: Oil Pan Gasket
Courtesy of GENERAL MOTORS CORP.

OIL PUMP REMOVAL

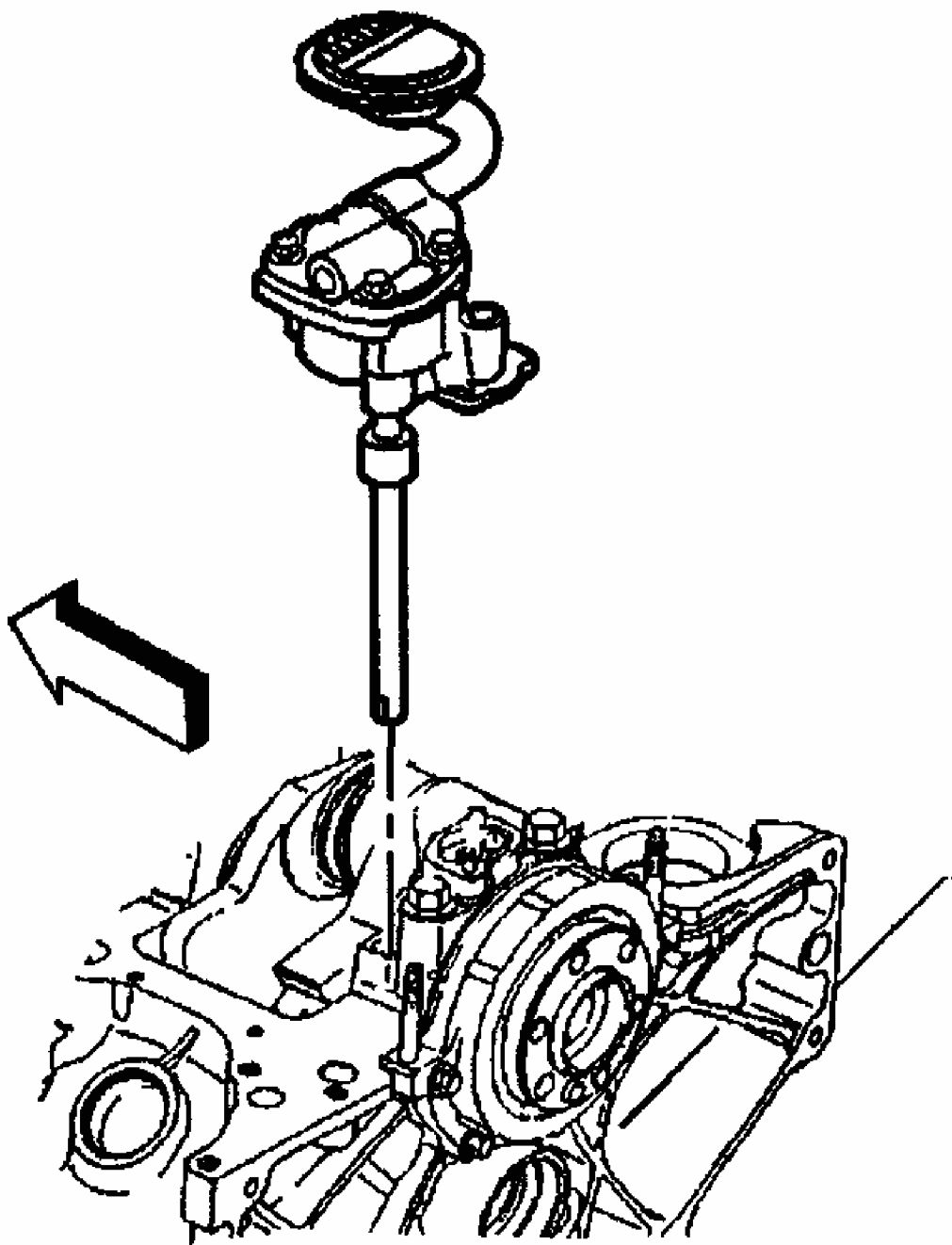
1. Remove the oil pump bolt.



G02502805

Fig. 71: Oil Pump Bolt
Courtesy of GENERAL MOTORS CORP.

2. Remove the oil pump.

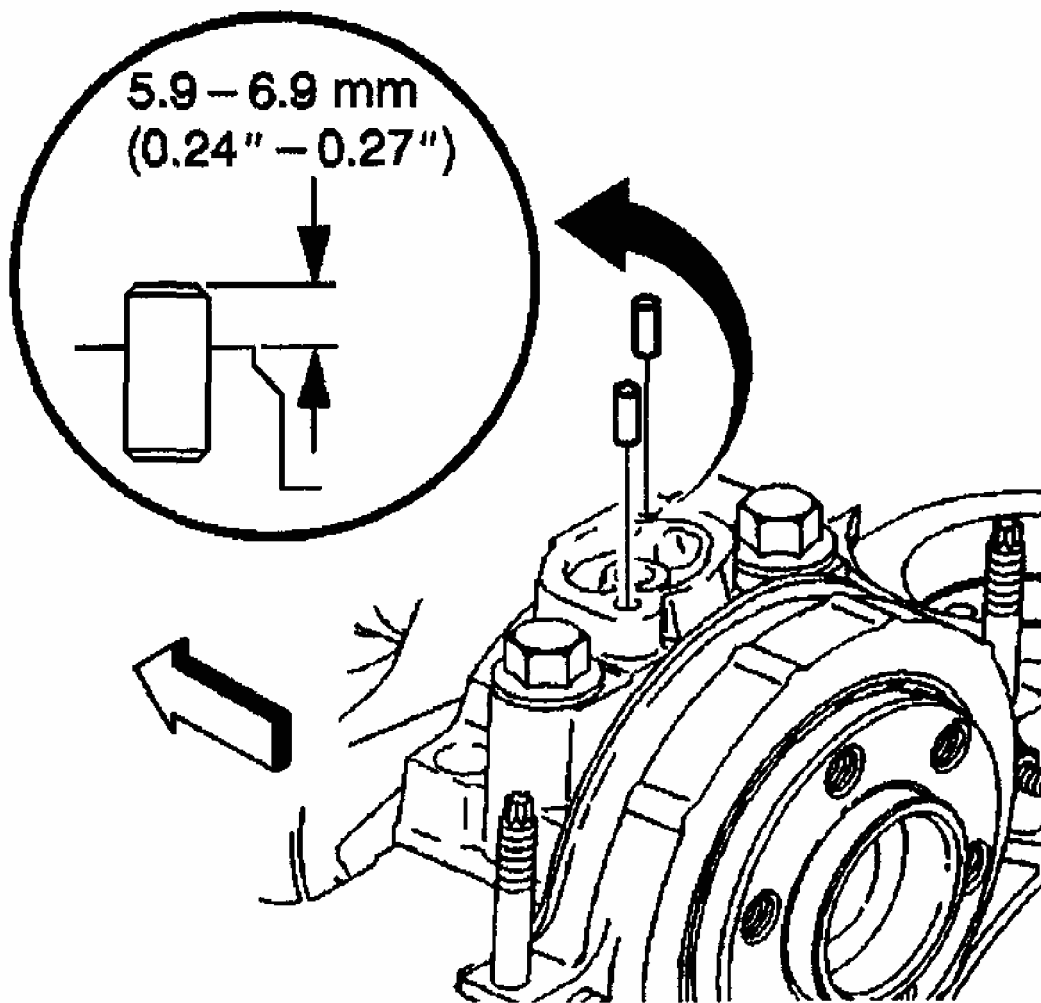


G02502806

Fig. 72: Oil Pump

Courtesy of GENERAL MOTORS CORP.

3. Inspect the oil pump locator pins for damage, and replace the pins if required.

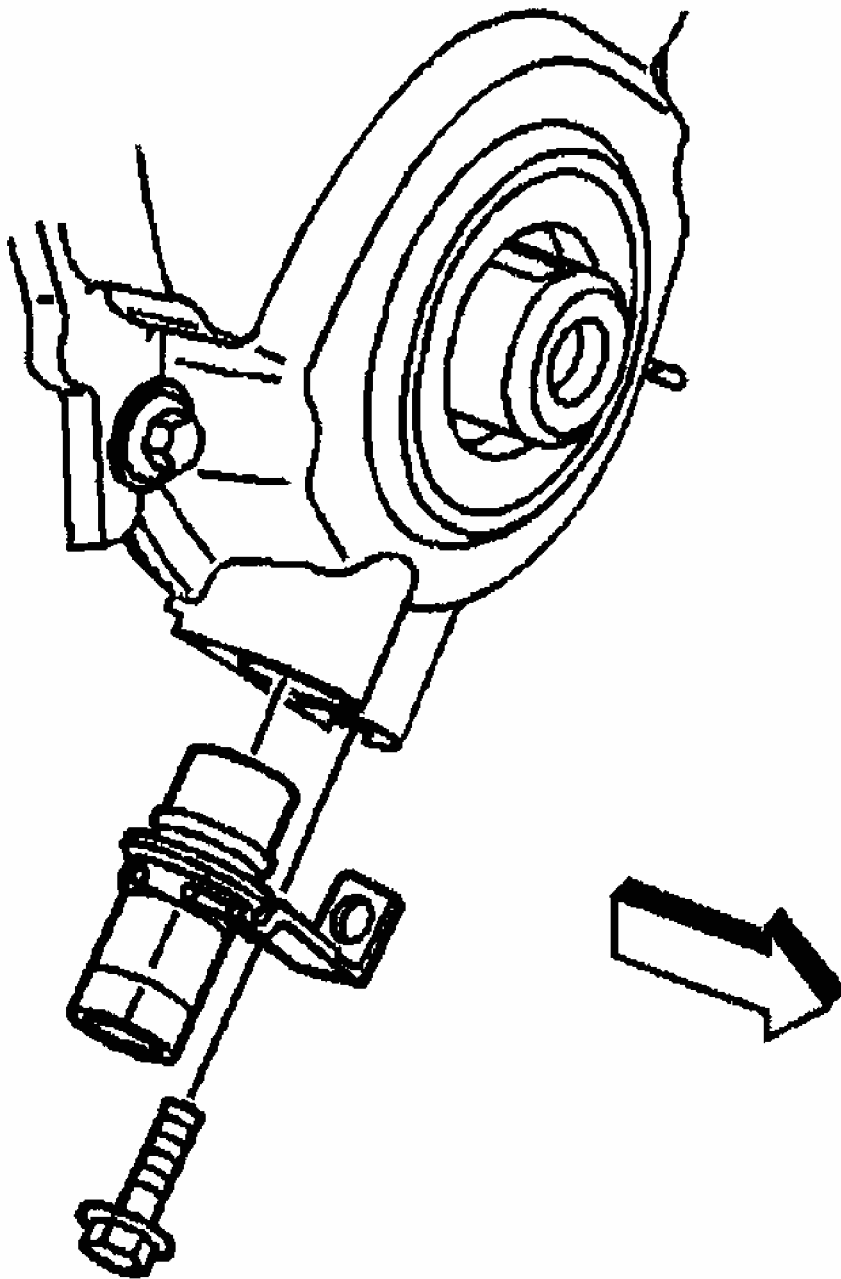


G02502807

Fig. 73: Oil Pump Locator Pins
Courtesy of GENERAL MOTORS CORP.

ENGINE FRONT COVER REMOVAL

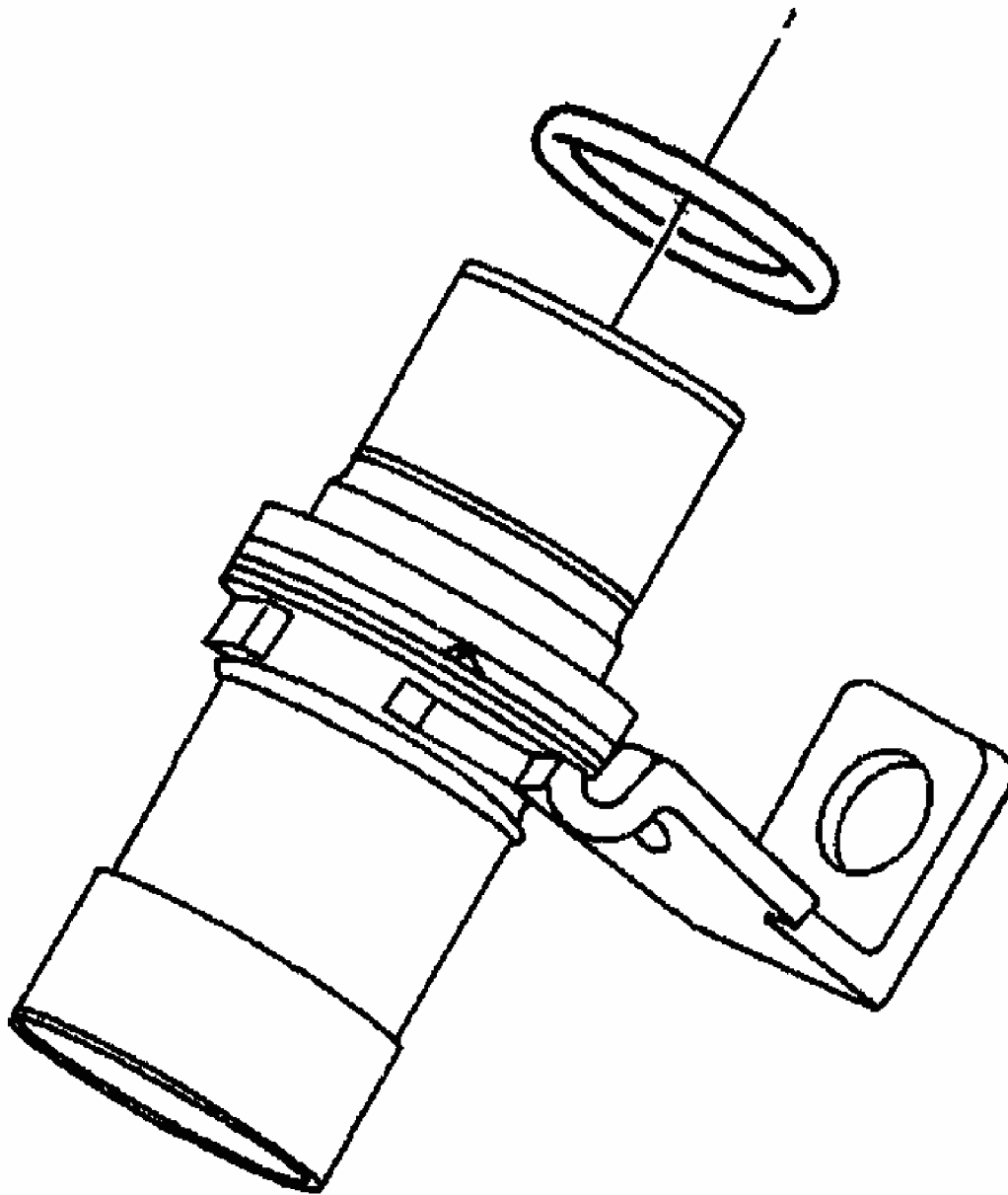
1. Remove the crankshaft position sensor bolt.
2. Remove the crankshaft position sensor.



G02502808

Fig. 74: Crankshaft Position Sensor
Courtesy of GENERAL MOTORS CORP.

3. Remove the crankshaft position sensor seal, O-ring.
4. Discard the crankshaft position sensor seal, O-ring.



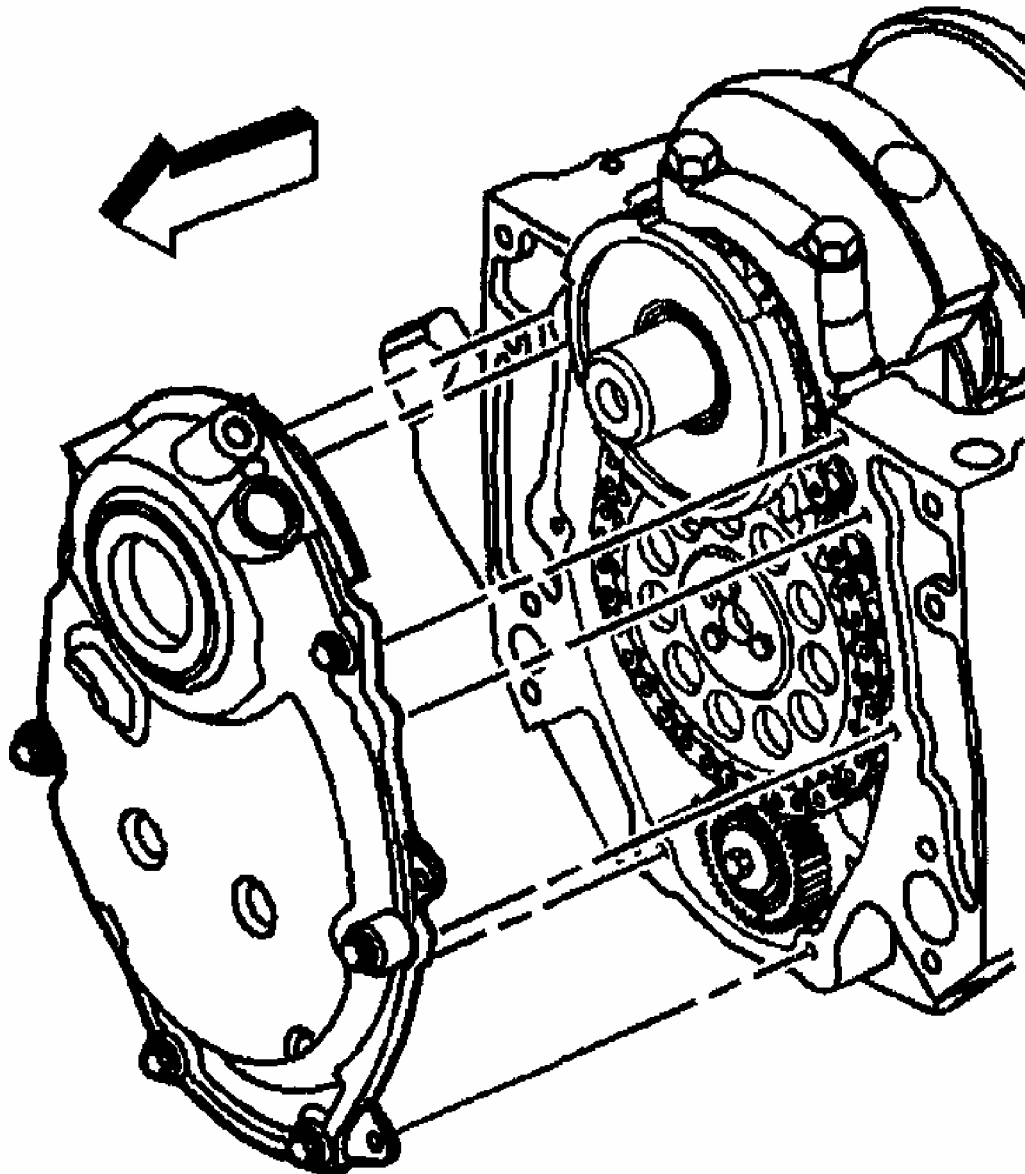
G02502809

Fig. 75: Crankshaft Position Sensor Seal
Courtesy of GENERAL MOTORS CORP.

5. Remove the engine front cover bolts.

Important: After the composite engine front cover is removed do not reinstall the engine front cover. Always install a NEW engine front cover.

6. Remove the engine front cover.
7. Discard the engine front cover.



G02502810

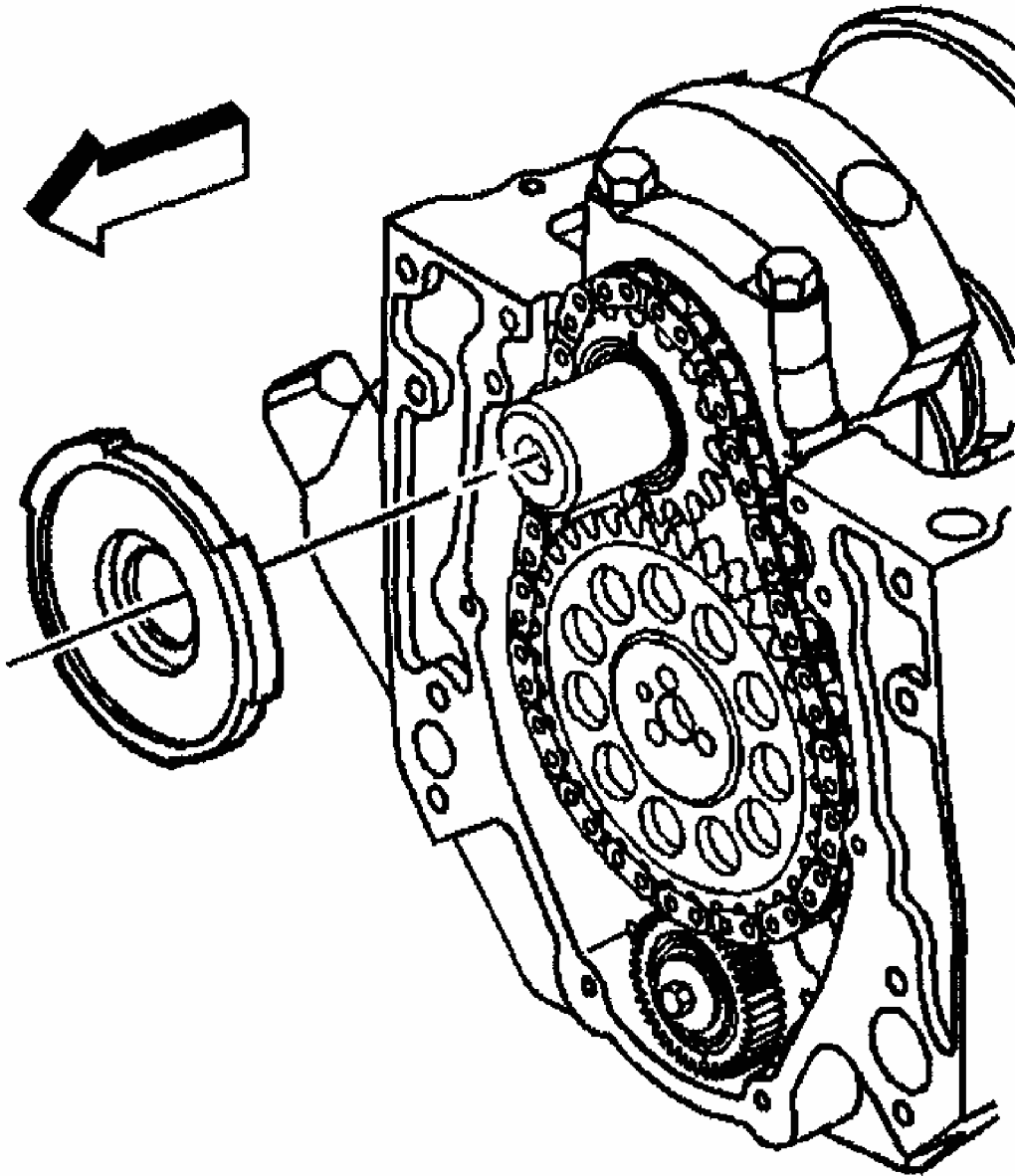
Fig. 76: Engine Front Cover
Courtesy of GENERAL MOTORS CORP.

TIMING CHAIN & SPROCKETS REMOVAL

Tools Required

J 5825-A Crankshaft Gear Remover

1. Remove the crankshaft position sensor reluctor ring.



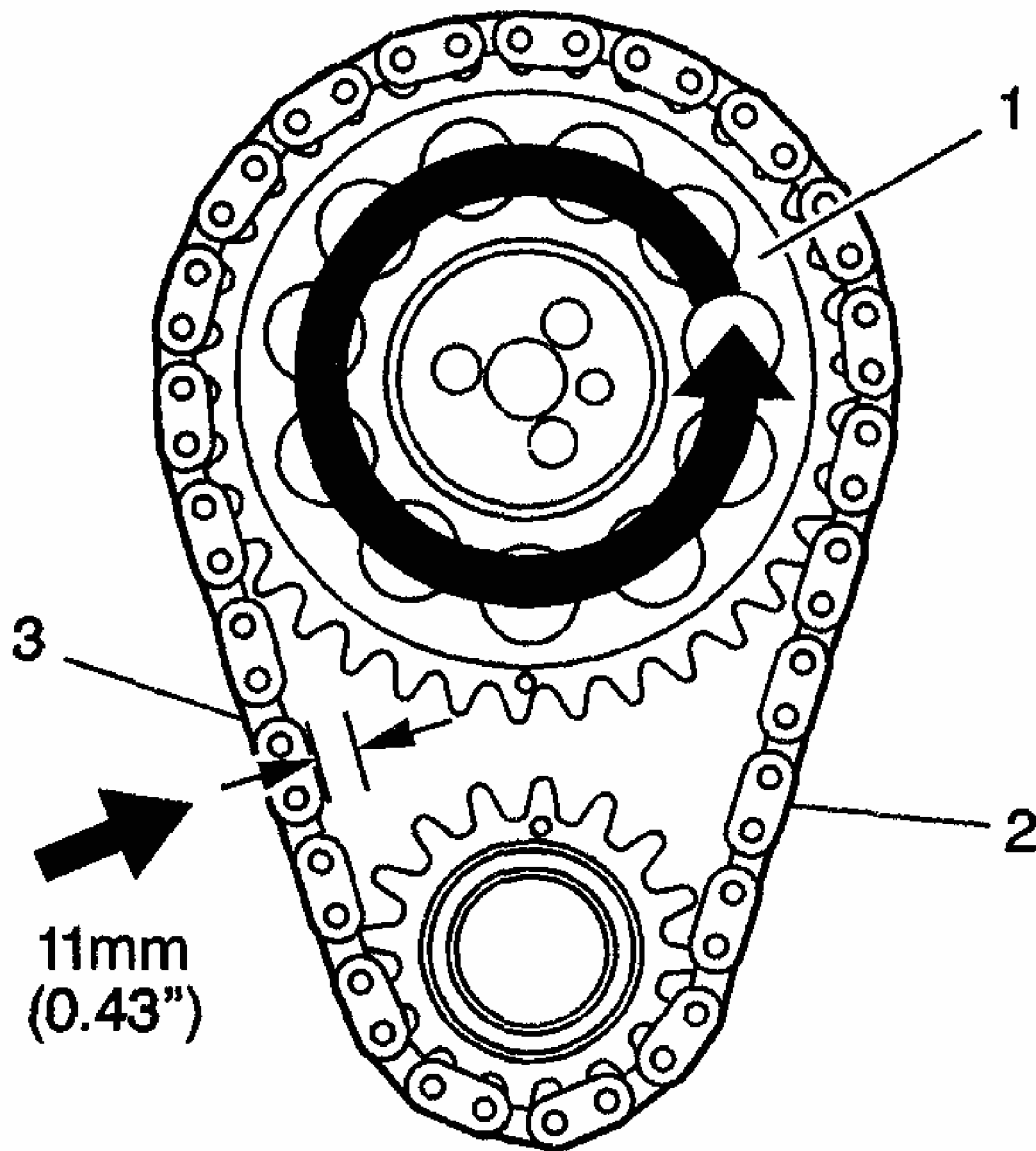
G02502811

Fig. 77: Crankshaft Position Sensor Reluctor Ring
Courtesy of GENERAL MOTORS CORP.

2. Check the camshaft timing chain free play.
 - 2.1. Rotate the camshaft sprocket (1) counterclockwise until all slack is removed

from the camshaft timing chain (2).

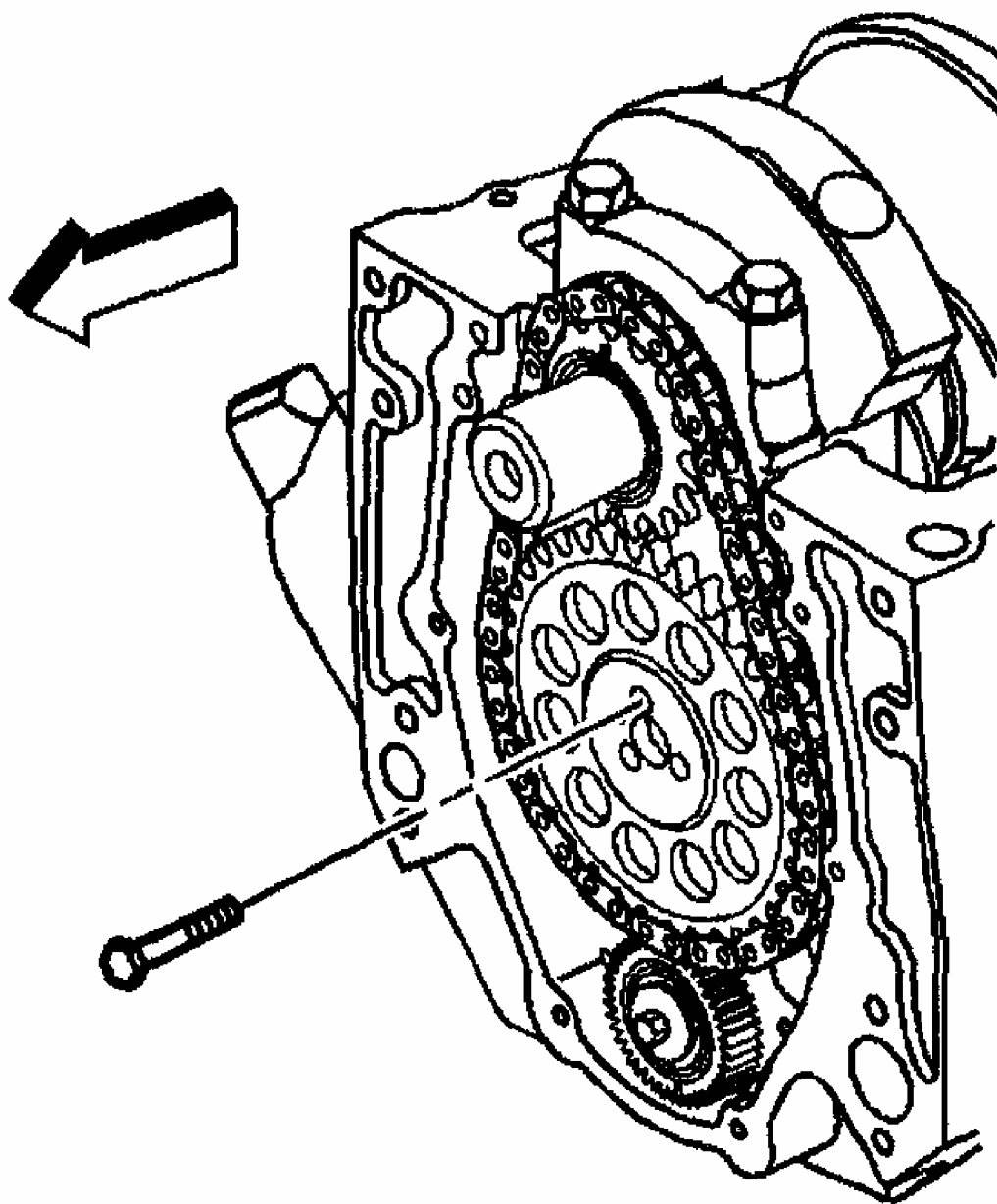
2.2. Measure the free play on the slack side (3) of the camshaft timing chain. If the camshaft timing chain can be moved side to side in excess of 11 mm (0.43 in), replacement of the camshaft timing chain and the sprockets is recommended during assembly.



G02502812

Fig. 78: Checking Camshaft Timing Chain Free Play
Courtesy of GENERAL MOTORS CORP.

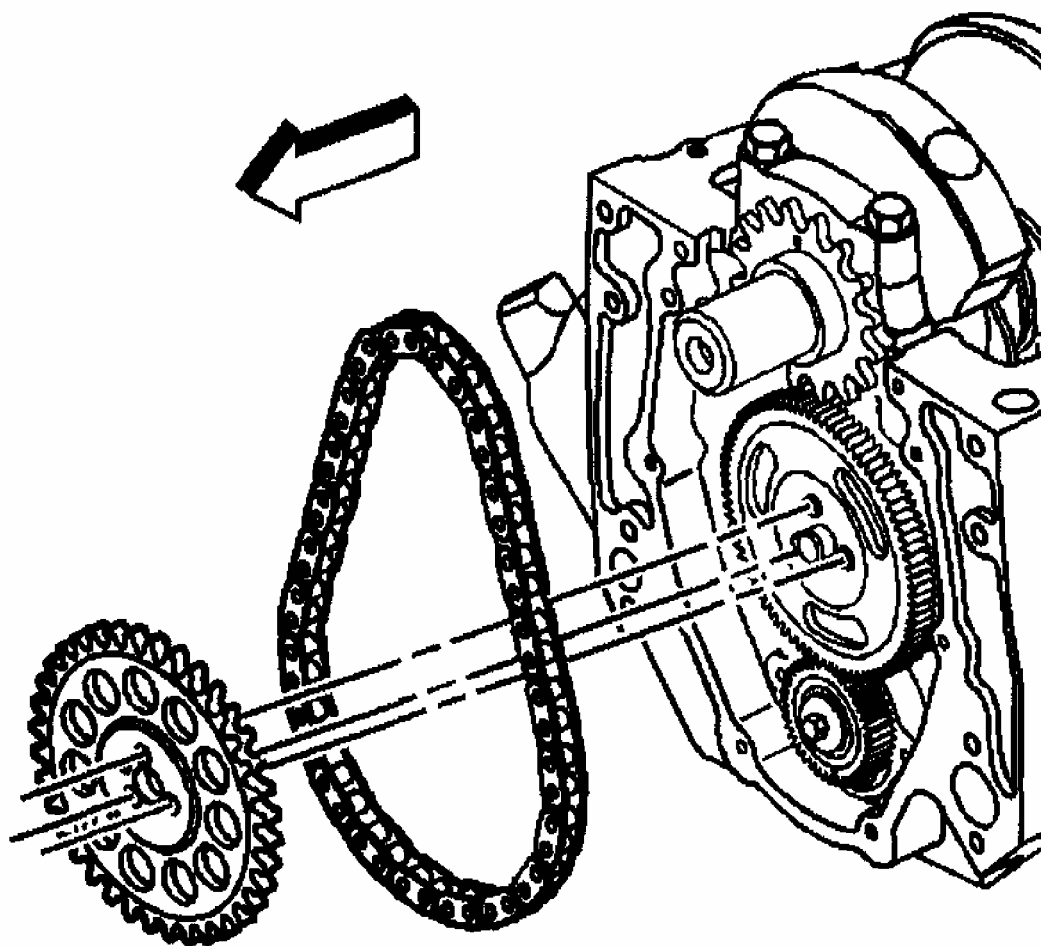
3. Remove the camshaft sprocket bolts.



G02502813

Fig. 79: Camshaft Sprocket Bolt
Courtesy of GENERAL MOTORS CORP.

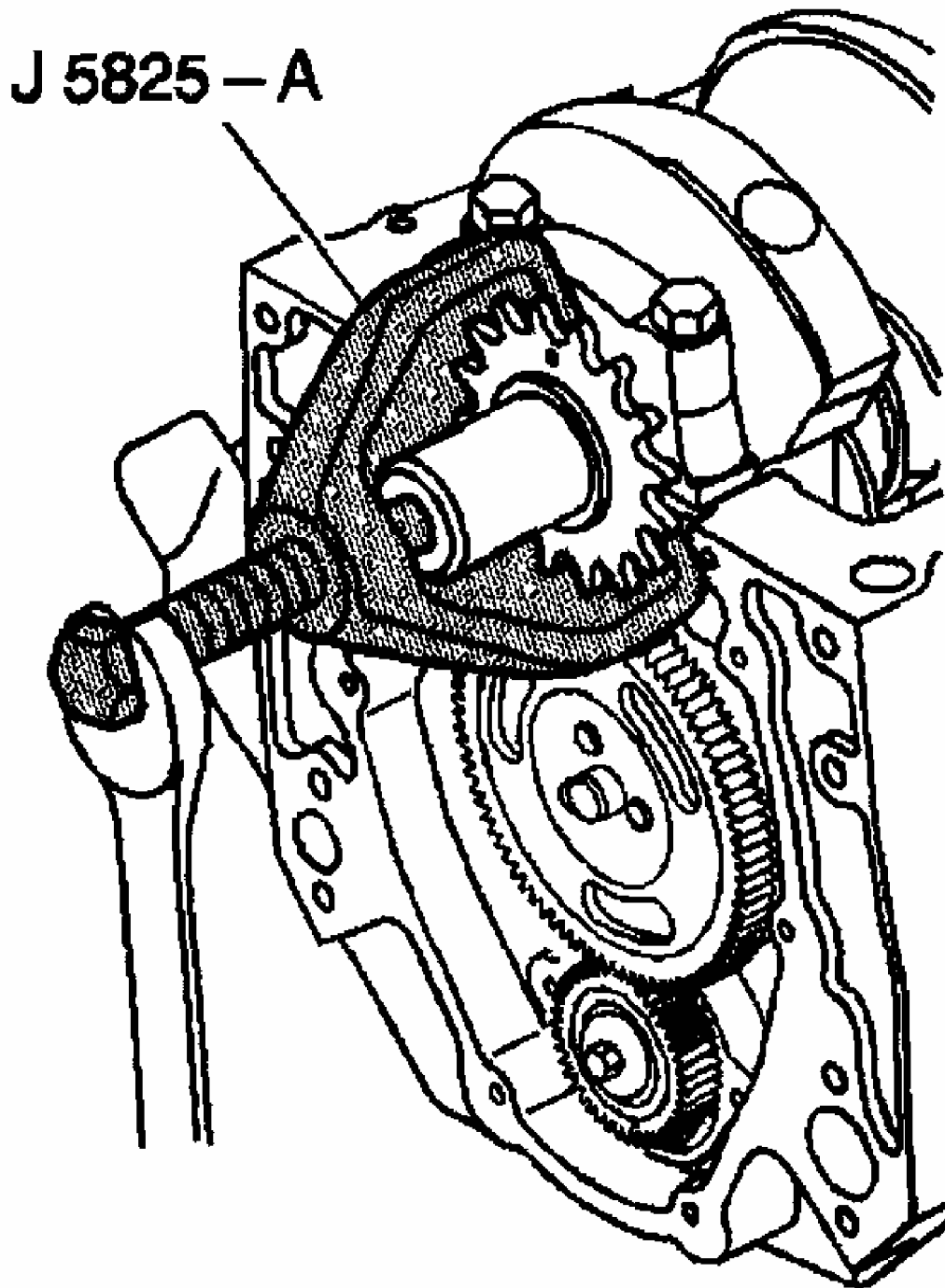
4. Remove the camshaft sprocket and the camshaft timing chain.



G02502814

Fig. 80: Camshaft Sprocket & Timing Chain
Courtesy of GENERAL MOTORS CORP.

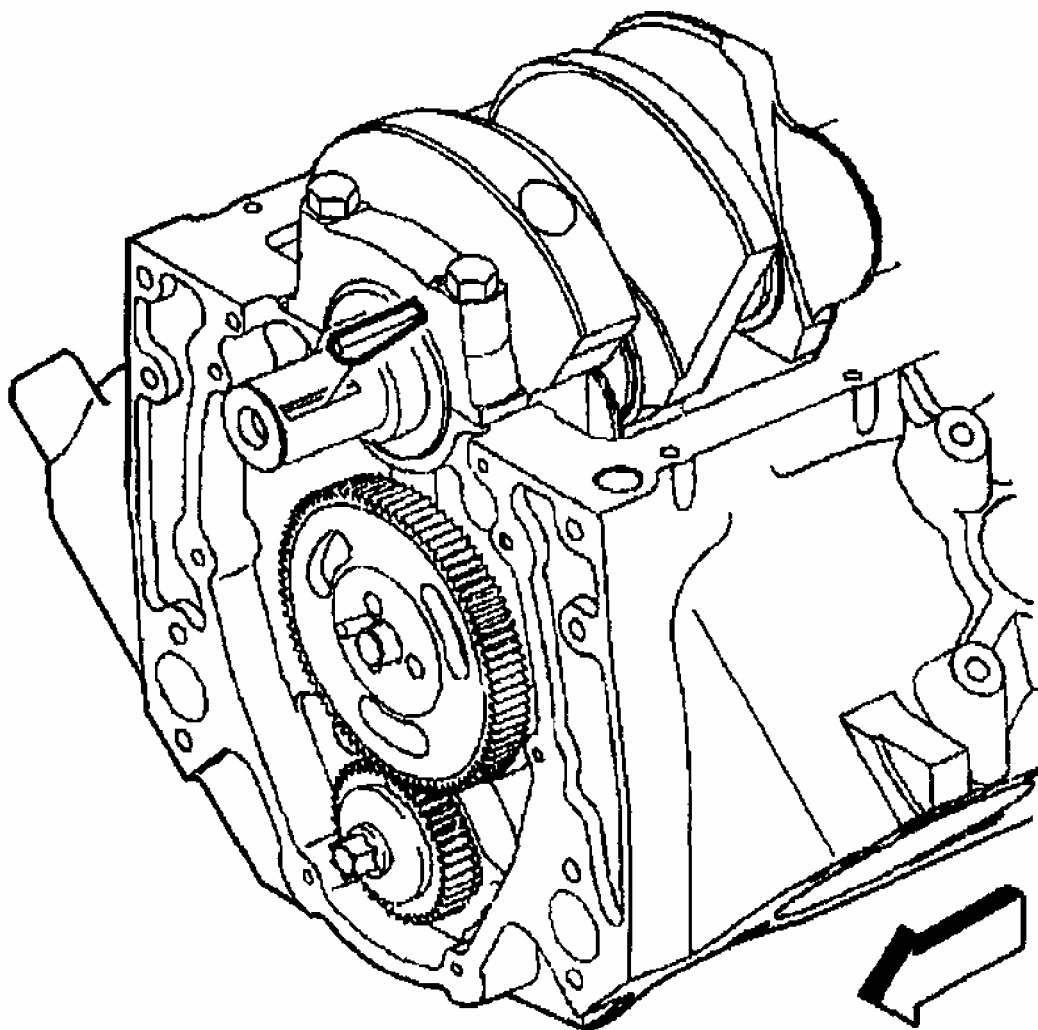
5. Remove the crankshaft sprocket using the J 5825-A.



G02502815

Fig. 81: Removing Crankshaft Sprocket
Courtesy of GENERAL MOTORS CORP.

6. Remove the crankshaft balancer key.

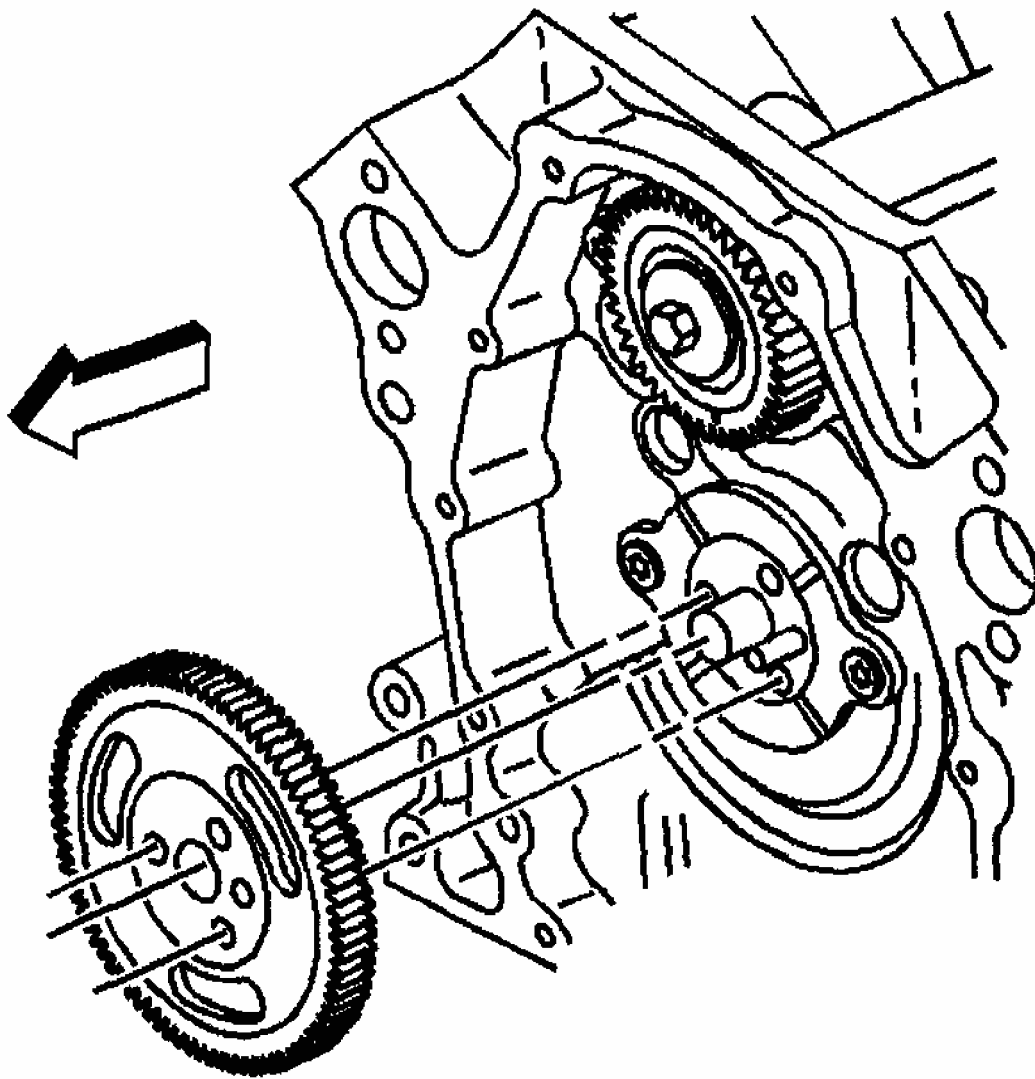


G02502816

Fig. 82: Crankshaft Balancer Key
Courtesy of GENERAL MOTORS CORP.

BALANCE SHAFT REMOVAL

1. Remove the balance shaft drive gear.

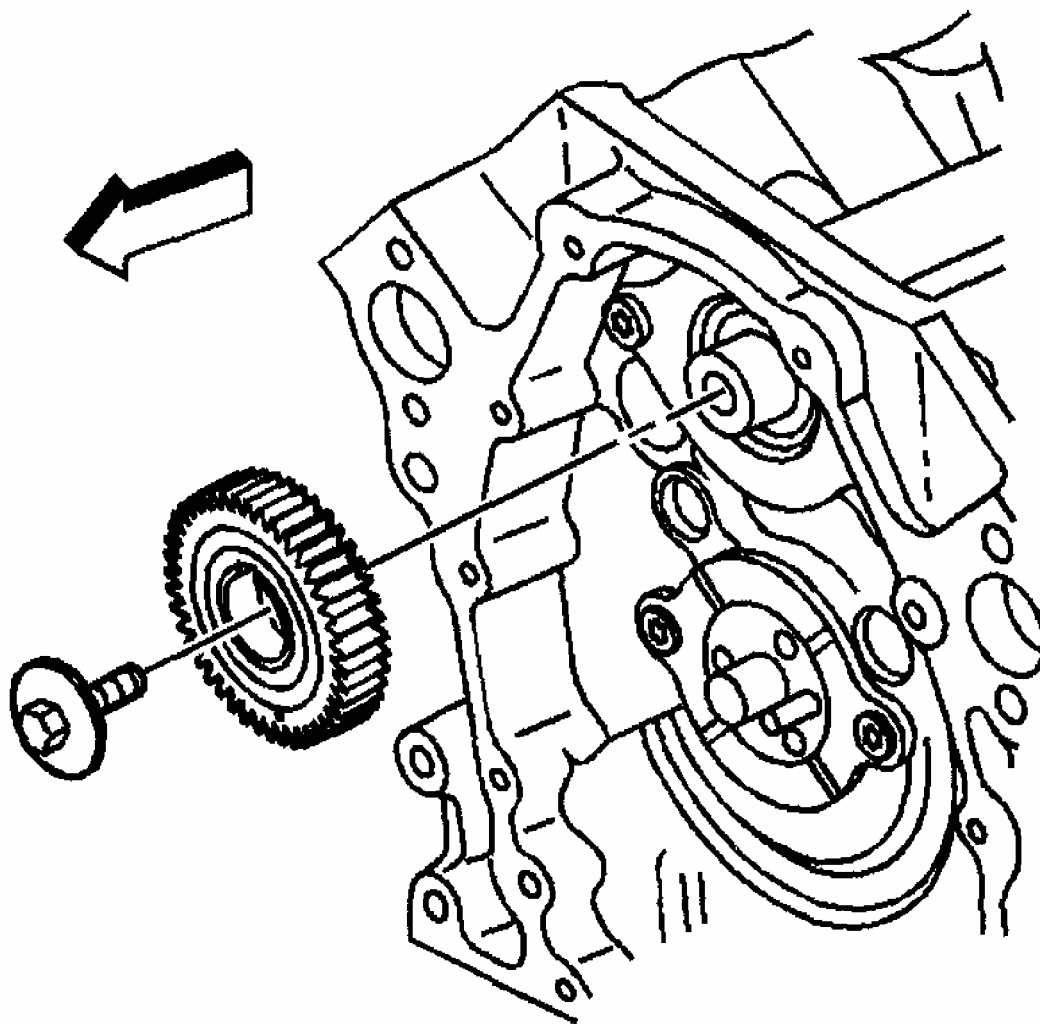


G02502817

Fig. 83: Balance Shaft Drive Gear
Courtesy of GENERAL MOTORS CORP.

Important: The balance shaft drive and balance shaft driven gears are serviced as a set. The set includes the balance shaft driven gear bolt.

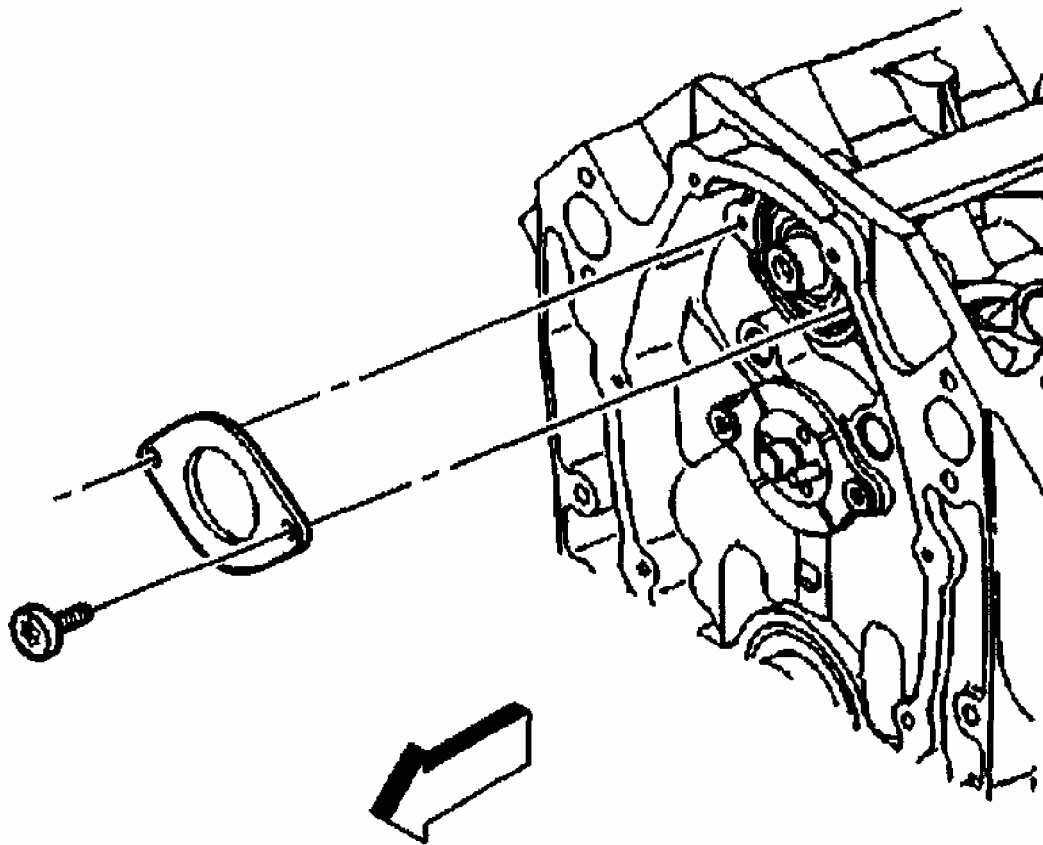
2. Remove the balance shaft driven gear bolt from the balance shaft.
 - 2.1. Use a wrench in order to secure the balance shaft. Place the wrench onto the balance shaft near to the balance shaft front bearing.
 - 2.2. Remove the balance shaft bolt.
 - 2.3. Remove the wrench from the balance shaft.



G02502818

Fig. 84: Balance Shaft Driven Gear
Courtesy of GENERAL MOTORS CORP.

3. Remove the balance shaft driven gear from the balance shaft.
4. Remove the bolts and the balance shaft retainer.

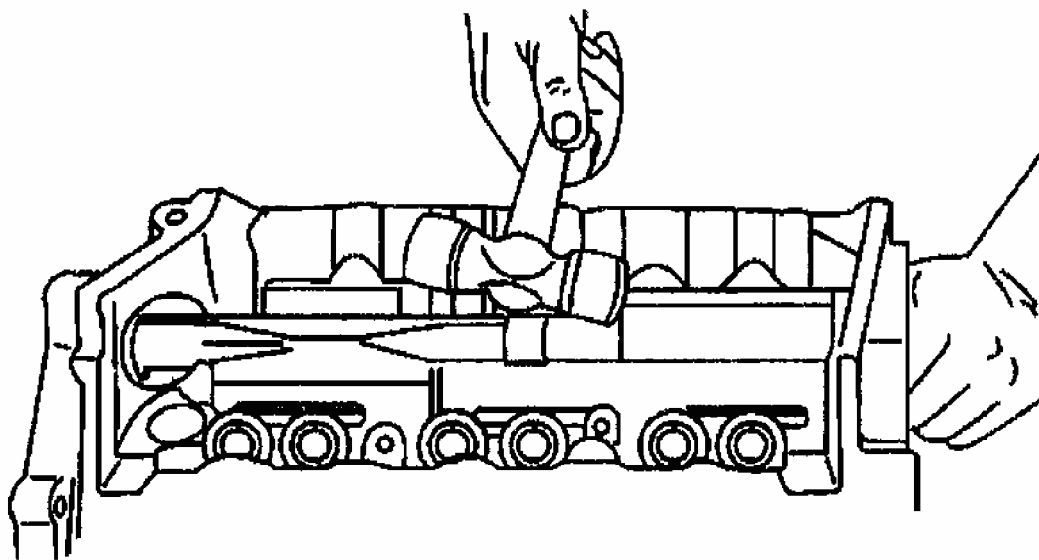


G02502819

Fig. 85: Balance Shaft Retainer
Courtesy of GENERAL MOTORS CORP.

Important: The balance shaft and the balance shaft front bearing are serviced only as a package. Do not remove the balance shaft front bearing from the balance shaft.

5. Use a soft-faced hammer in order to remove the balance shaft from the engine block.

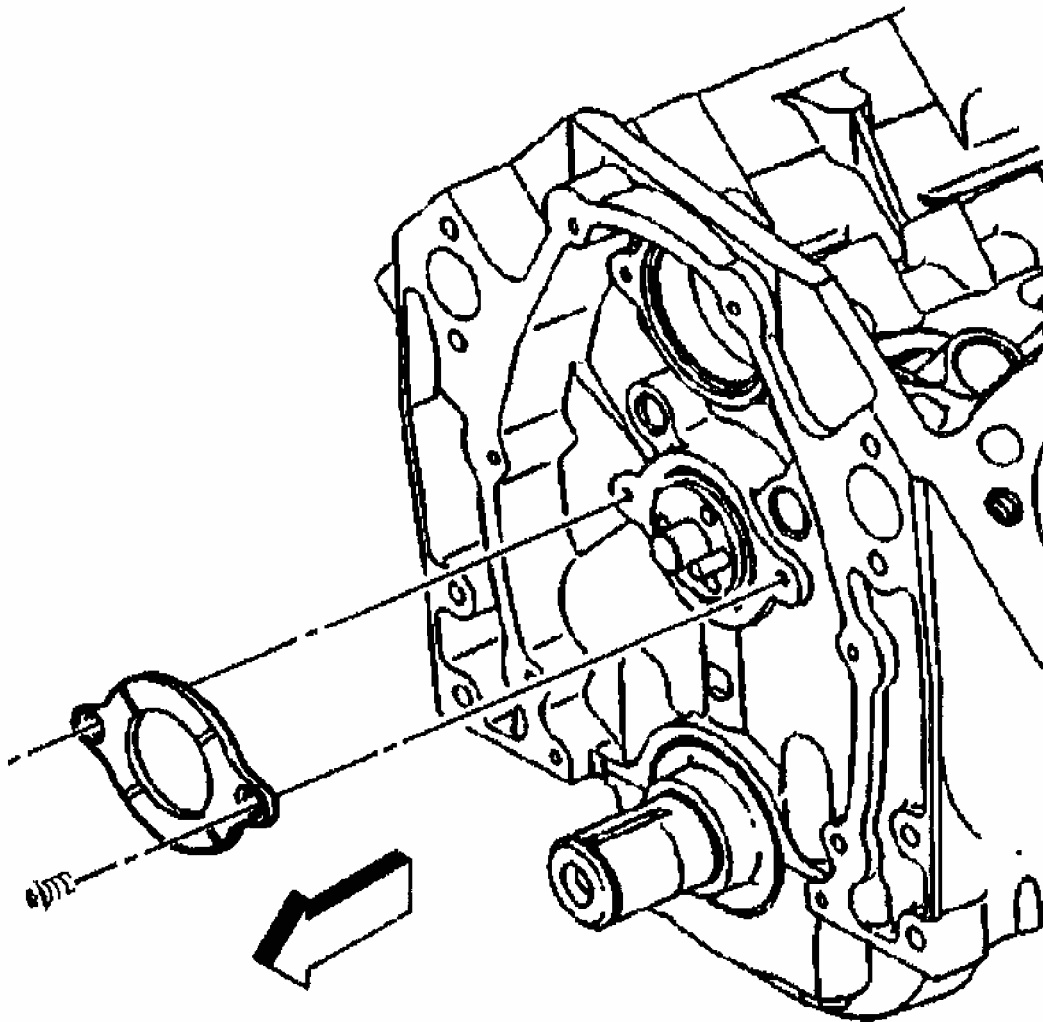


G02502820

Fig. 86: Removing Balance Shaft From Engine Block
Courtesy of GENERAL MOTORS CORP.

CAMSHAFT REMOVAL

1. Remove the camshaft retainer bolts and retainer.

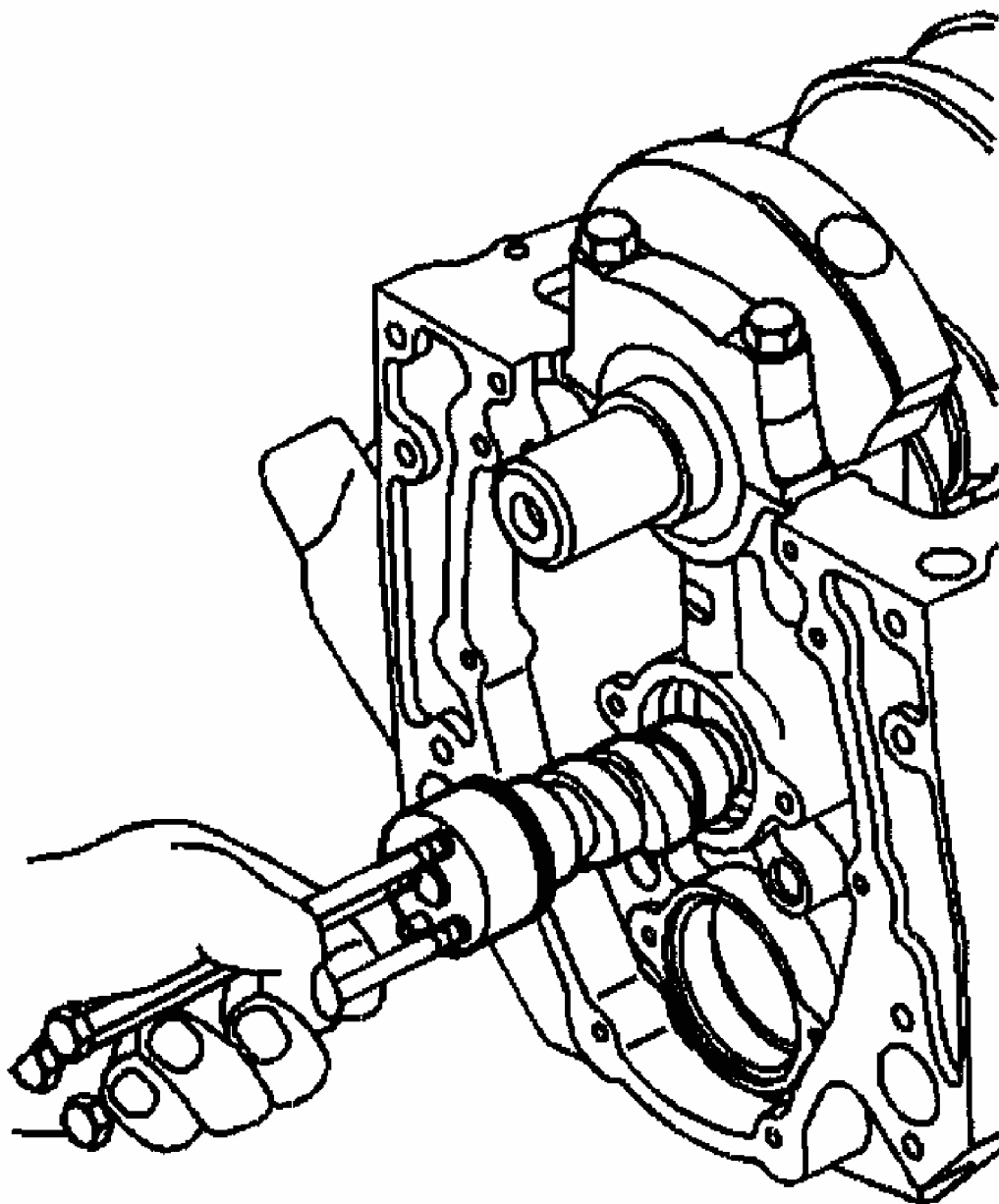


G02502821

Fig. 87: Camshaft Retainer
Courtesy of GENERAL MOTORS CORP.

NOTE: All camshaft journals are the same diameter, so care must be used in removing or installing the camshaft to avoid damage to the camshaft bearings.

2. Remove the engine camshaft.
 - 2.1. Install the three 5/16-18 x 4.0 inch bolts into the engine camshaft front bolt holes.
 - 2.2. Using the bolts as a handle, carefully rotate and pull the engine camshaft out of the camshaft bearings.
 - 2.3. Remove the bolts from the front of the engine camshaft.



G02502822

Fig. 88: Removing Engine Camshaft
Courtesy of GENERAL MOTORS CORP.

PISTON, CONNECTING ROD & BEARING REMOVAL

Tools Required

- **J 5239** Connecting Rod Bolt Guide Set

- **J 24270** Cylinder Bore Ridge Reamer

1. Use the **J 24270** in order to remove the cylinder ring ridge.
 - 1.1. Turn the crankshaft until the piston is at the bottom of the stroke.
 - 1.2. Place a cloth on top of the piston.
 - 1.3. Use the **J 24270** to remove all of the cylinder ring ridge.
 - 1.4. Turn the crankshaft so the piston is at the top of the stroke.
 - 1.5. Remove the cloth.
 - 1.6. Remove the cutting debris.

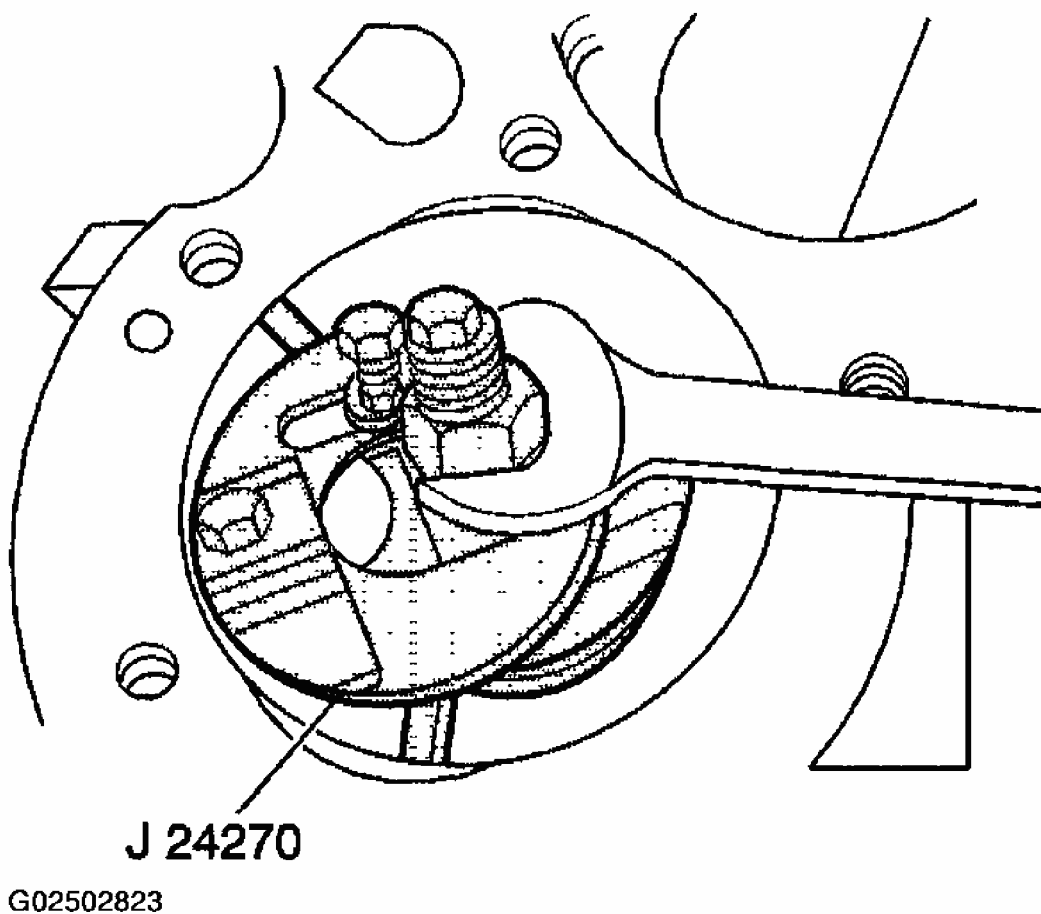
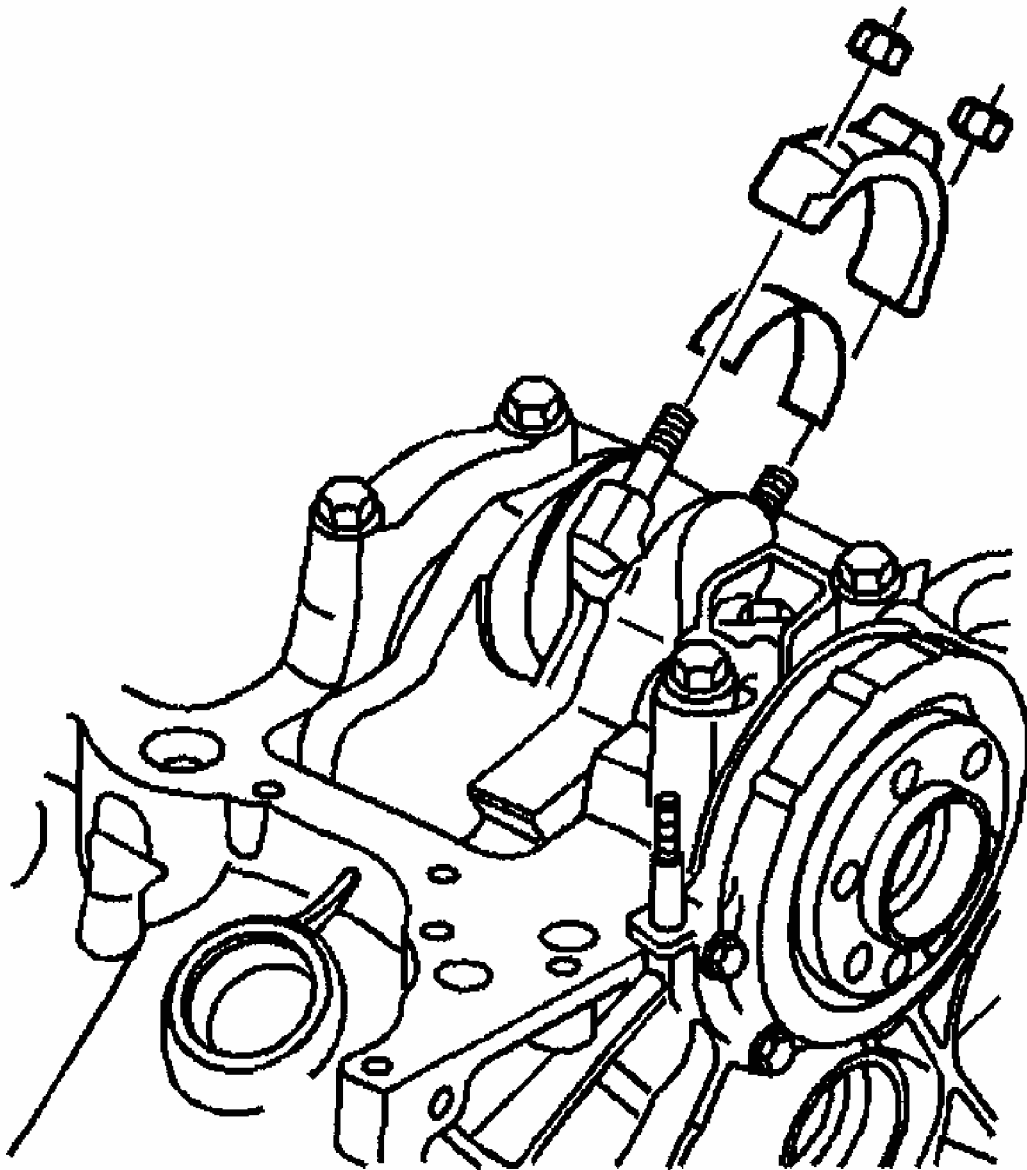


Fig. 89: Removing Cylinder Ring Ridge
Courtesy of GENERAL MOTORS CORP.

Important: Place matchmarks or numbers on the connecting rods and the connecting rod caps.

2. Remove the connecting rod nuts.

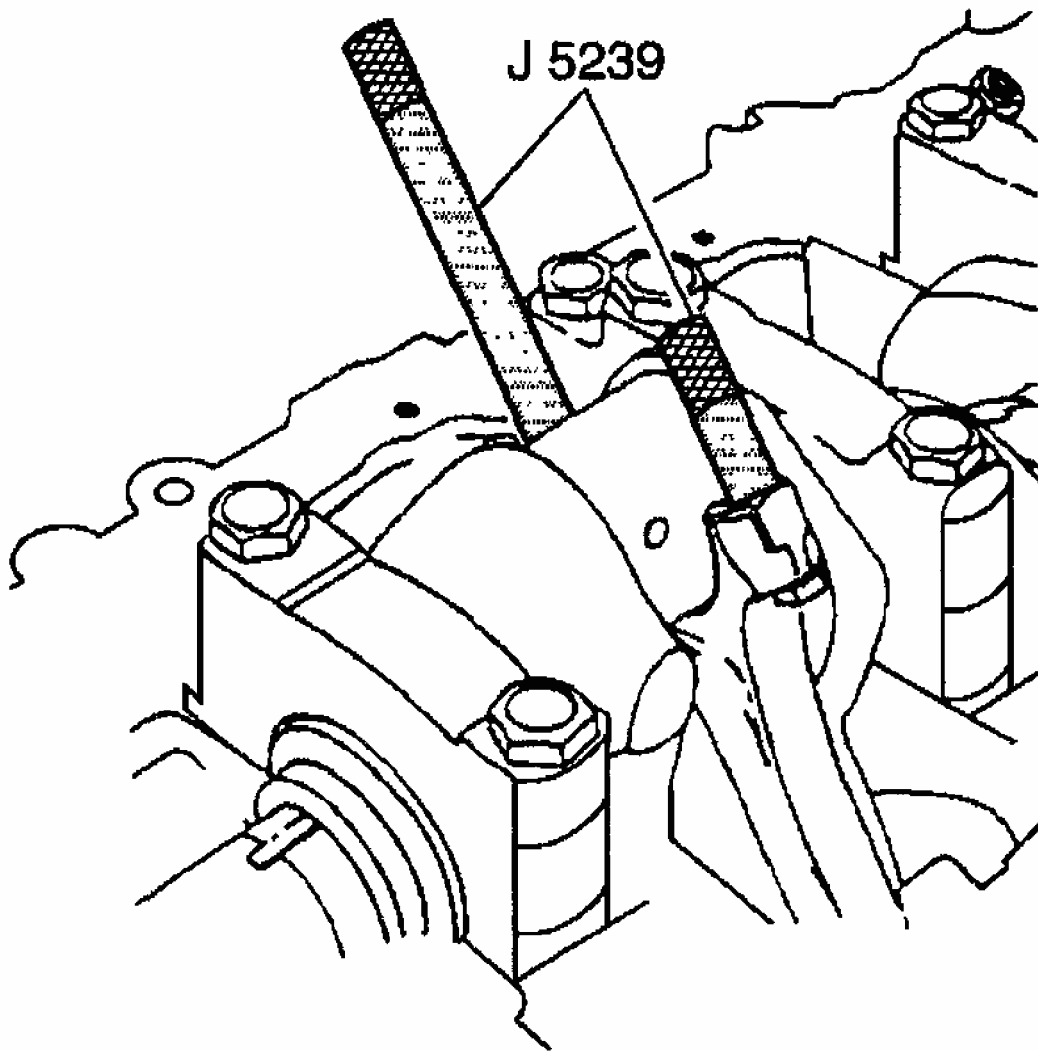
3. Remove the connecting rod cap.



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Fig. 90: Connecting Rod Cap
Courtesy of GENERAL MOTORS CORP.

4. Use the **J 5239** in order to protect the crankshaft journals and remove the connecting rod and the piston out of the top of the engine block.

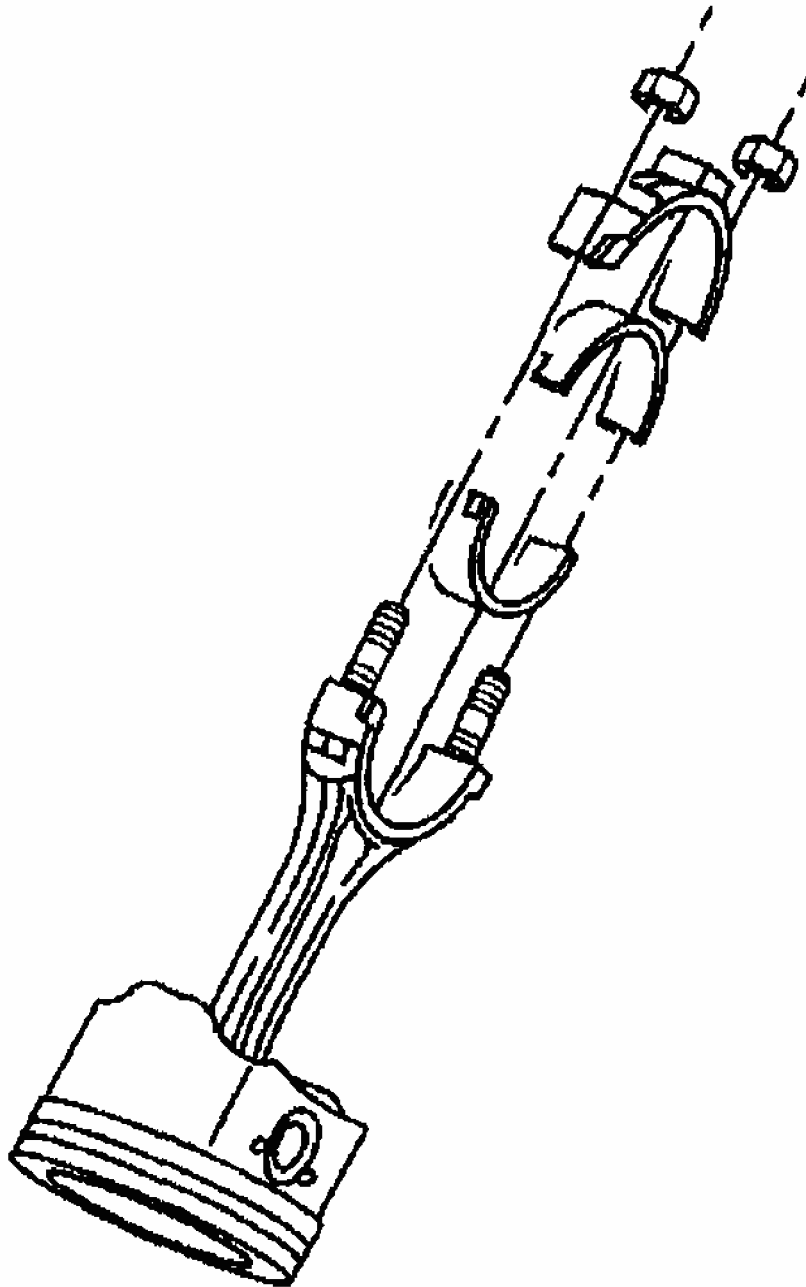


G02502825

Fig. 91: Protecting Crankshaft Journals
Courtesy of GENERAL MOTORS CORP.

Important: Always assemble the connecting rod caps to the matching connecting rods.

5. Remove the connecting rod bearings.
 - Keep the connecting rod bearings with the original connecting rod and connecting rod cap.
 - Wipe the oil from the connecting rod bearings.
 - Wipe the oil from the crankpins.



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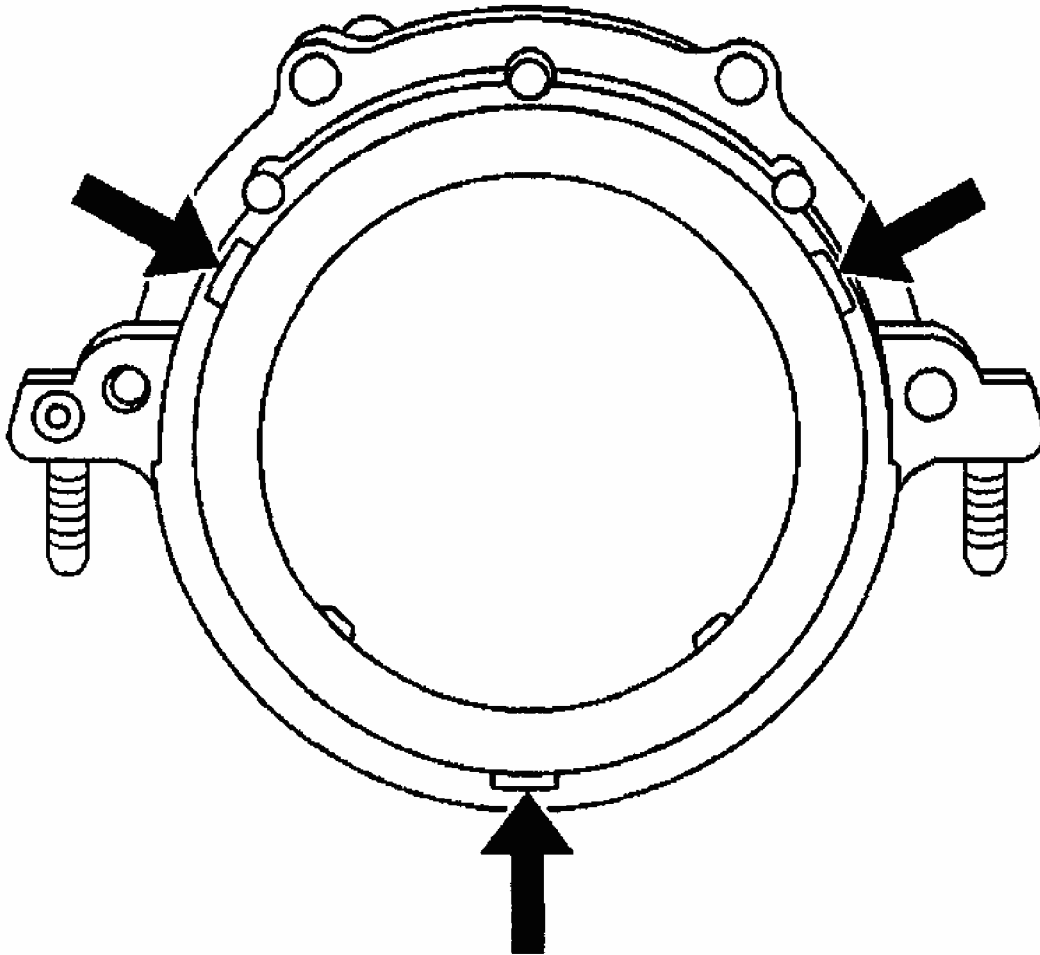
Fig. 92: Removing Connecting Rod Bearings
Courtesy of GENERAL MOTORS CORP.

CRANKSHAFT REAR OIL SEAL & HOUSING REMOVAL

1. Remove the crankshaft rear oil seal from the crankshaft rear oil seal housing. Insert a suitable tool into the access notches and then carefully pry the crankshaft rear oil seal

from the crankshaft rear oil seal housing.

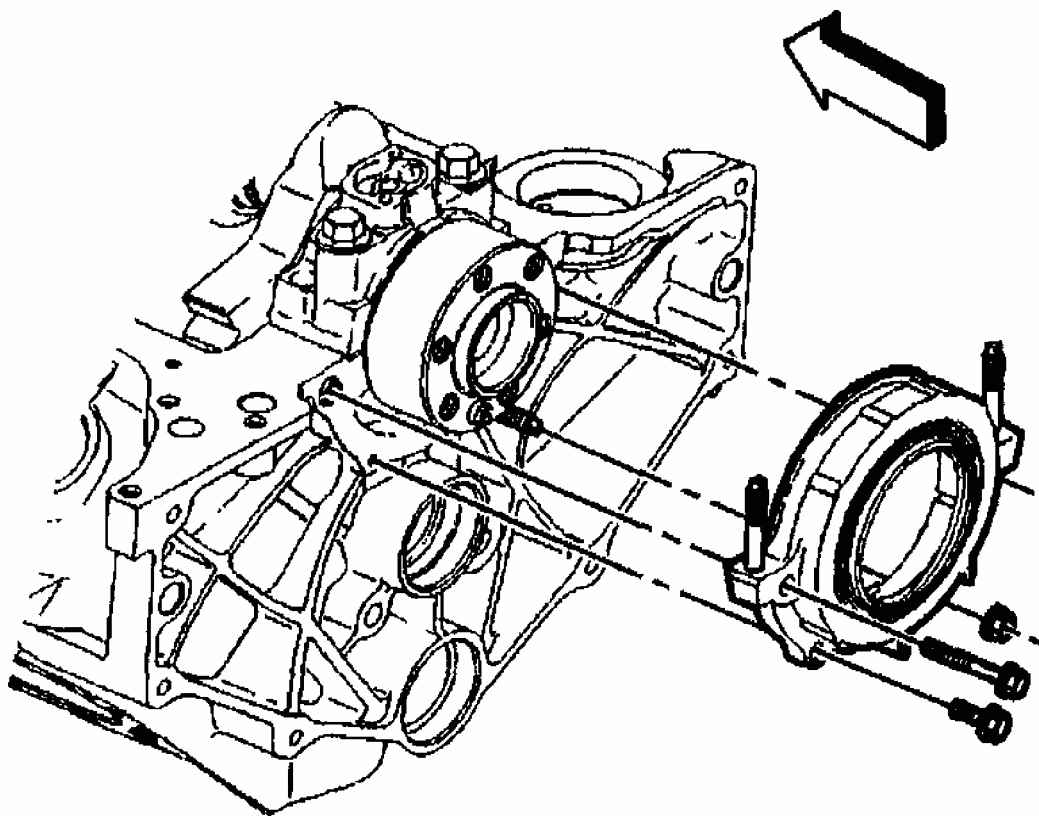
2. Discard the crankshaft rear oil seal.



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Fig. 93: Crankshaft Rear Oil Seal
Courtesy of GENERAL MOTORS CORP.

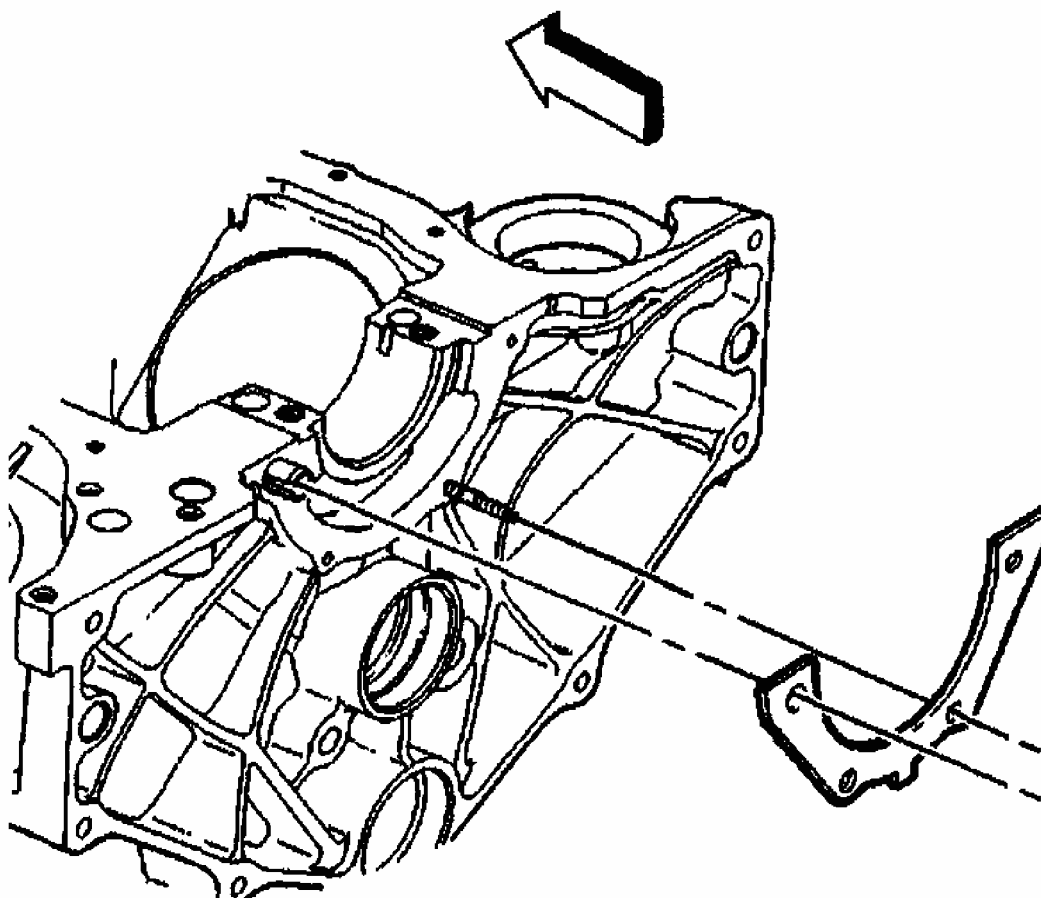
3. Remove the crankshaft rear oil seal housing nut and bolts.
4. Remove the crankshaft rear oil seal housing.



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Fig. 94: Crankshaft Rear Oil Seal Housing
Courtesy of GENERAL MOTORS CORP.

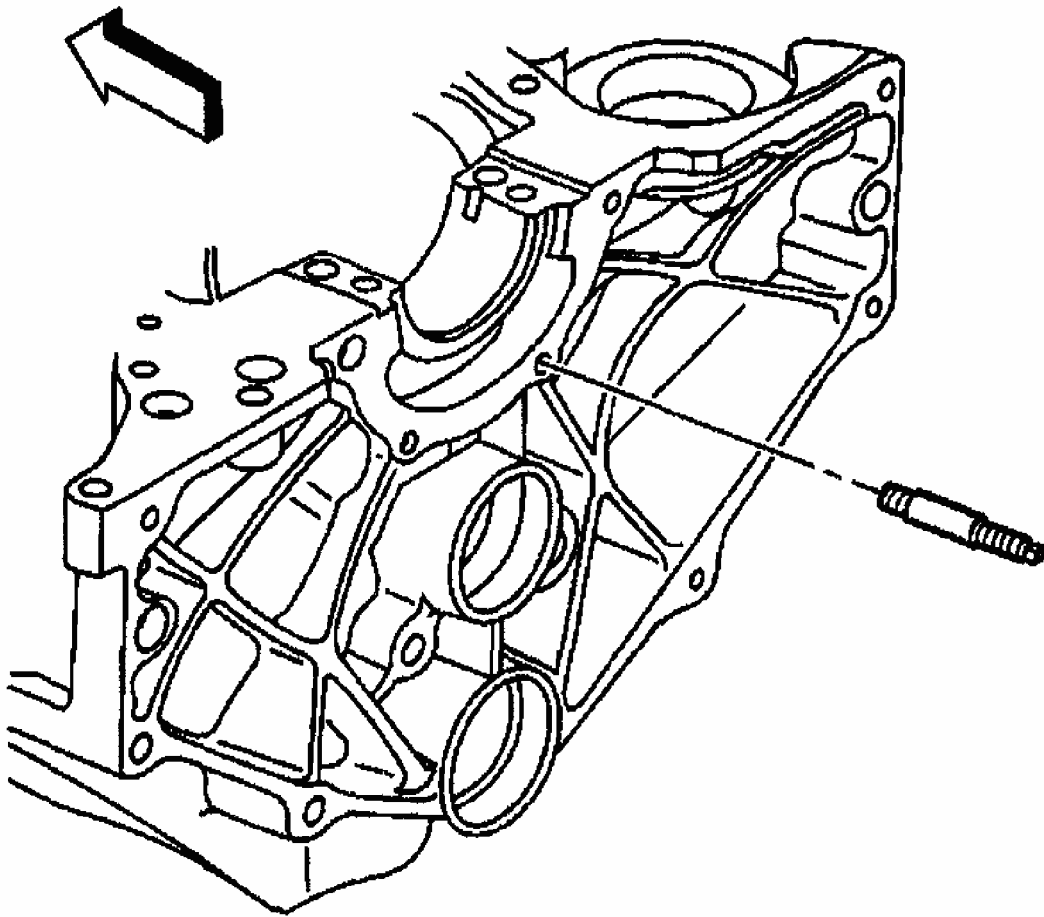
5. Remove the crankshaft rear oil seal housing gasket.
6. Discard the crankshaft rear oil seal housing gasket.



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Fig. 95: Crankshaft Rear Oil Seal Housing Gasket
Courtesy of GENERAL MOTORS CORP.

7. Remove the crankshaft rear oil seal housing retainer stud from the engine block.

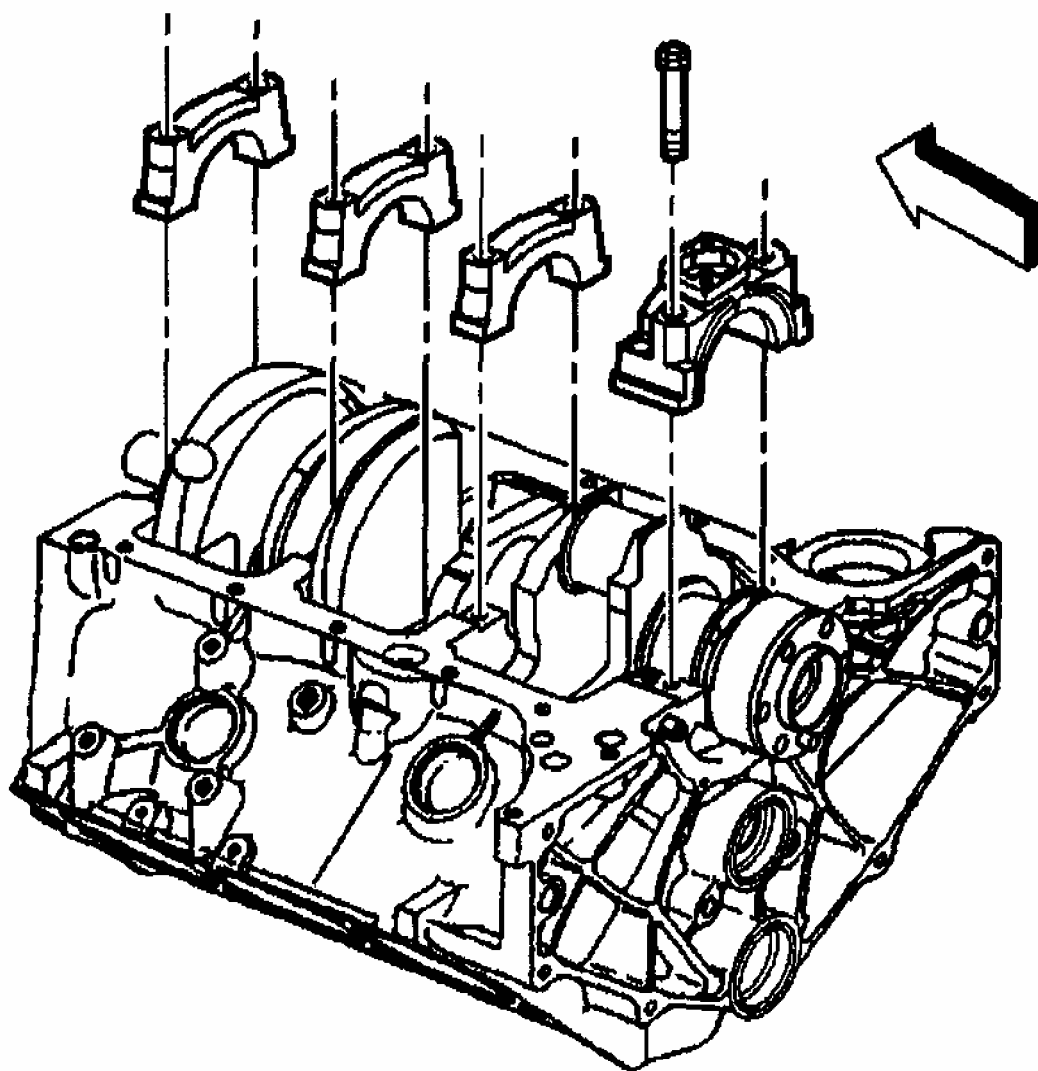


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Fig. 96: Crankshaft Rear Oil Seal Housing Retainer Stud
Courtesy of GENERAL MOTORS CORP.

CRANKSHAFT & BEARINGS REMOVAL

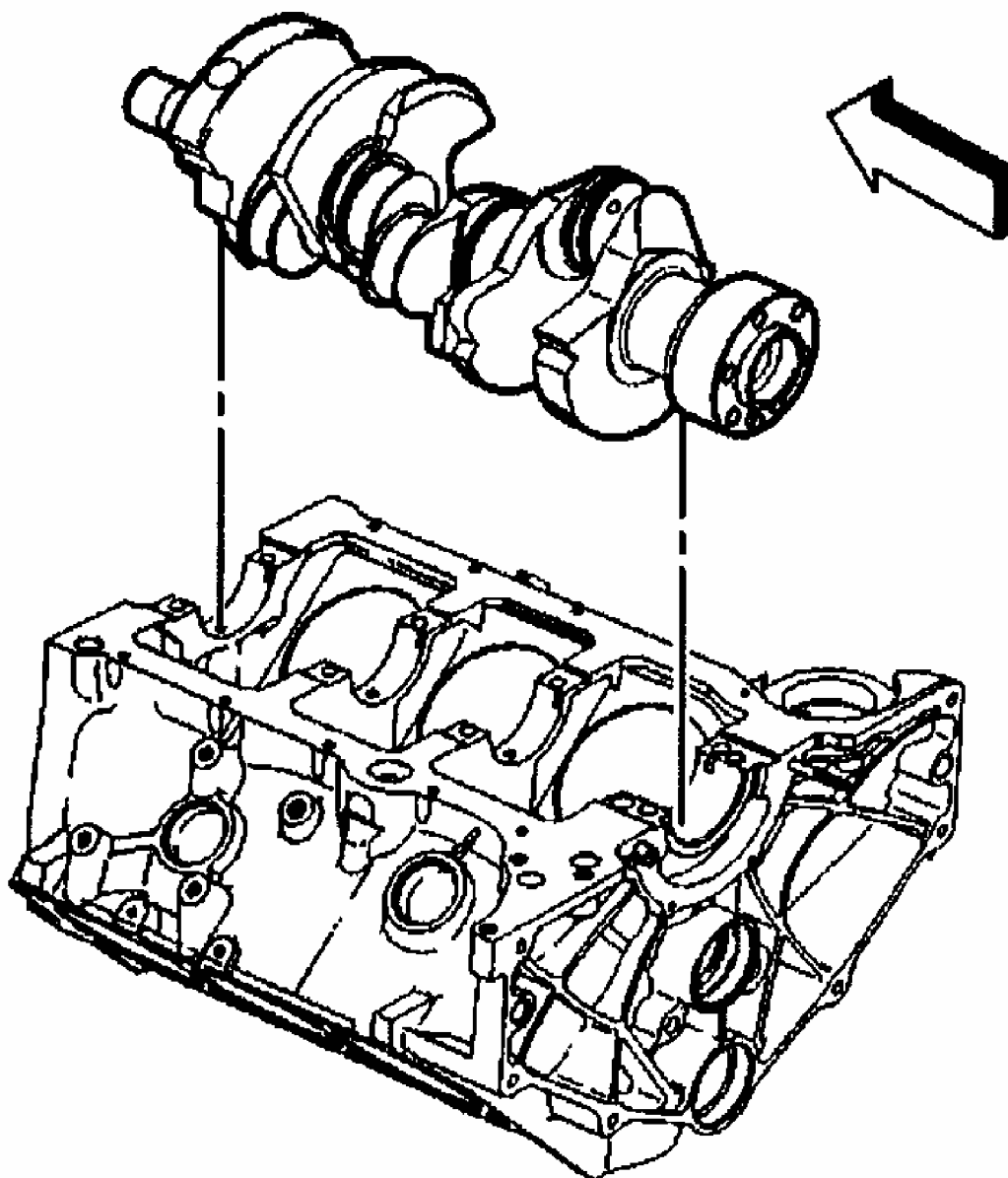
1. Mark or identify the crankshaft bearing cap locations, direction, and positions for assembly.
2. Remove the crankshaft bearing cap bolts.
3. Remove the crankshaft bearing caps.



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Fig. 97: Crankshaft Bearing Caps
Courtesy of GENERAL MOTORS CORP.

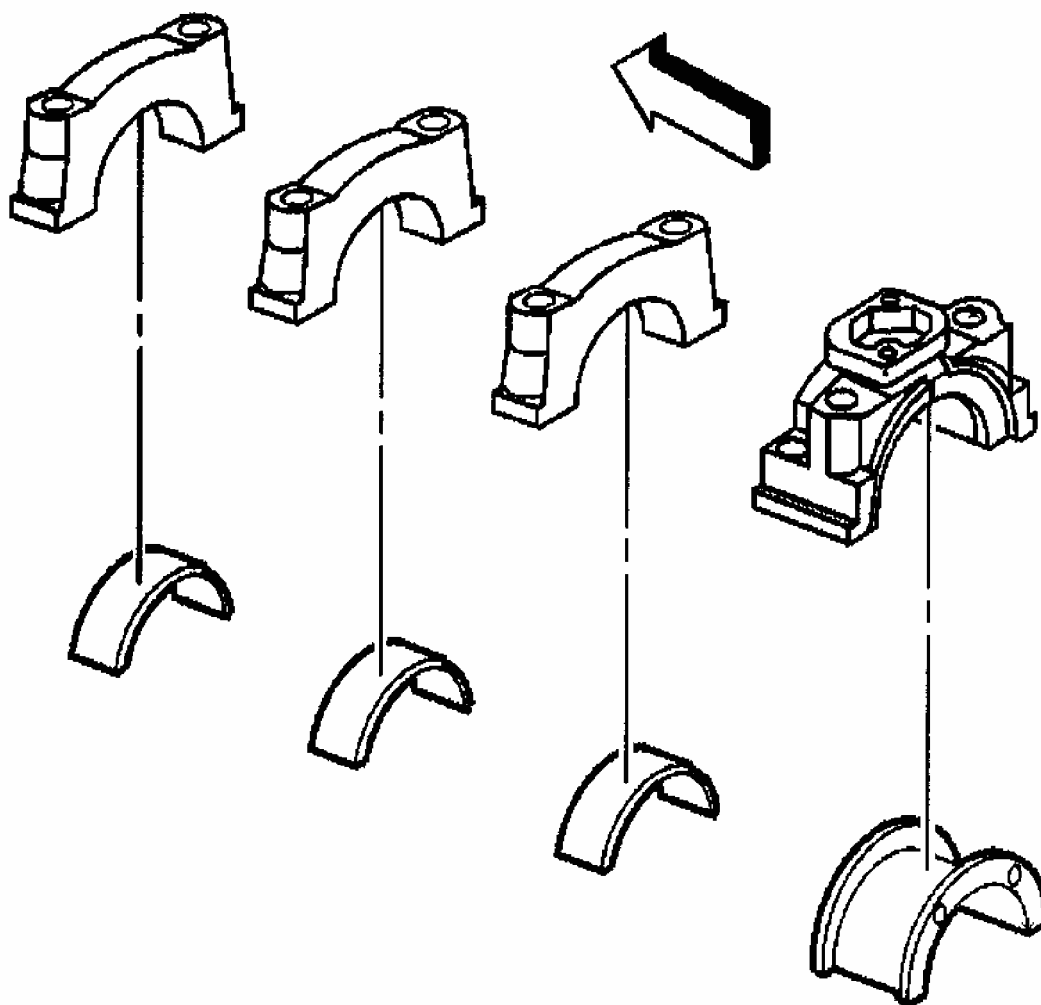
4. Remove the crankshaft.



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Fig. 98: Crankshaft
Courtesy of GENERAL MOTORS CORP.

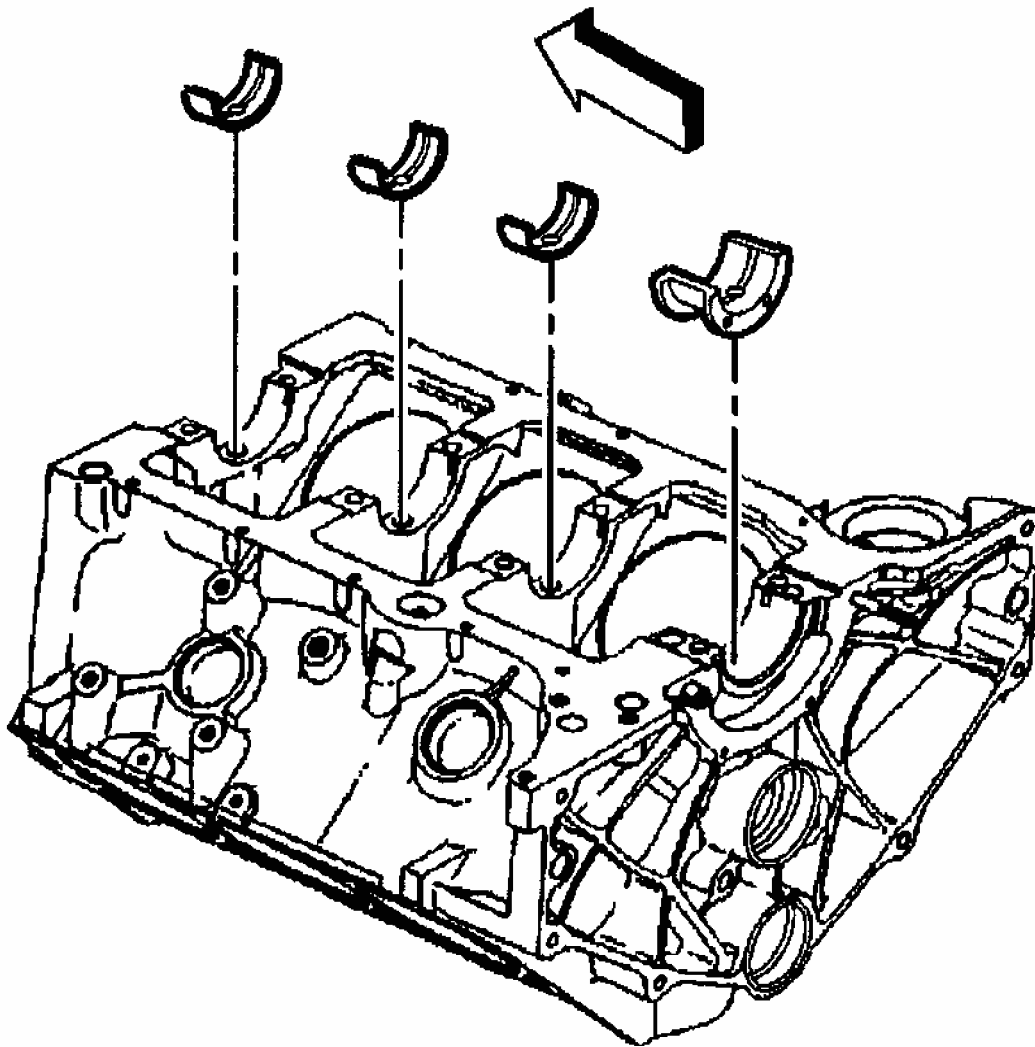
5. Remove the crankshaft bearings from the crankshaft bearing caps.



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Fig. 99: Crankshaft Bearings & Bearing Caps
Courtesy of GENERAL MOTORS CORP.

6. Remove the crankshaft bearings from the engine block.



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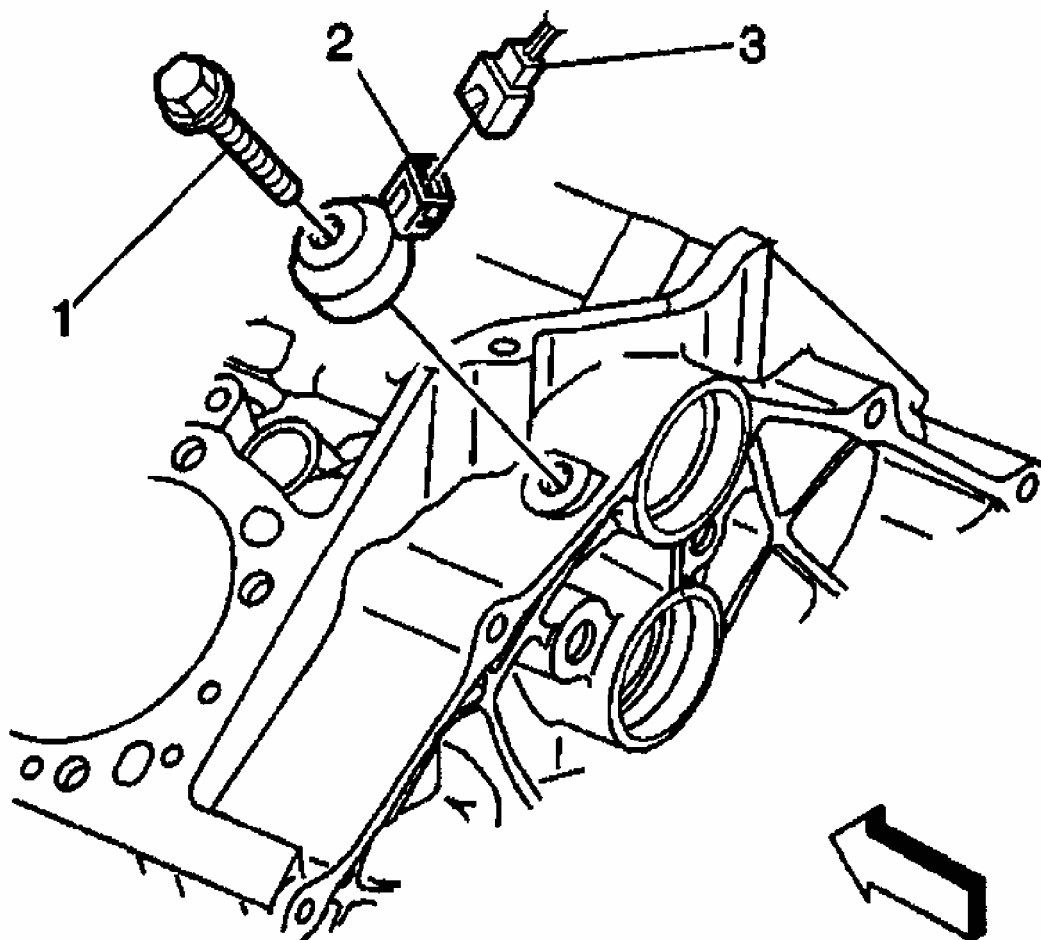
Fig. 100: Crankshaft Bearings At Engine Block
Courtesy of GENERAL MOTORS CORP.

ENGINE BLOCK PLUG REMOVAL

Tools Required

J 41712 Oil Pressure Switch Socket

1. Remove the knock sensor retaining bolt (1).
2. Remove the knock sensor (2).



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Fig. 101: Knock Sensor

Courtesy of GENERAL MOTORS CORP.

3. Remove the engine oil pressure gage sensor using the **J 41712**.

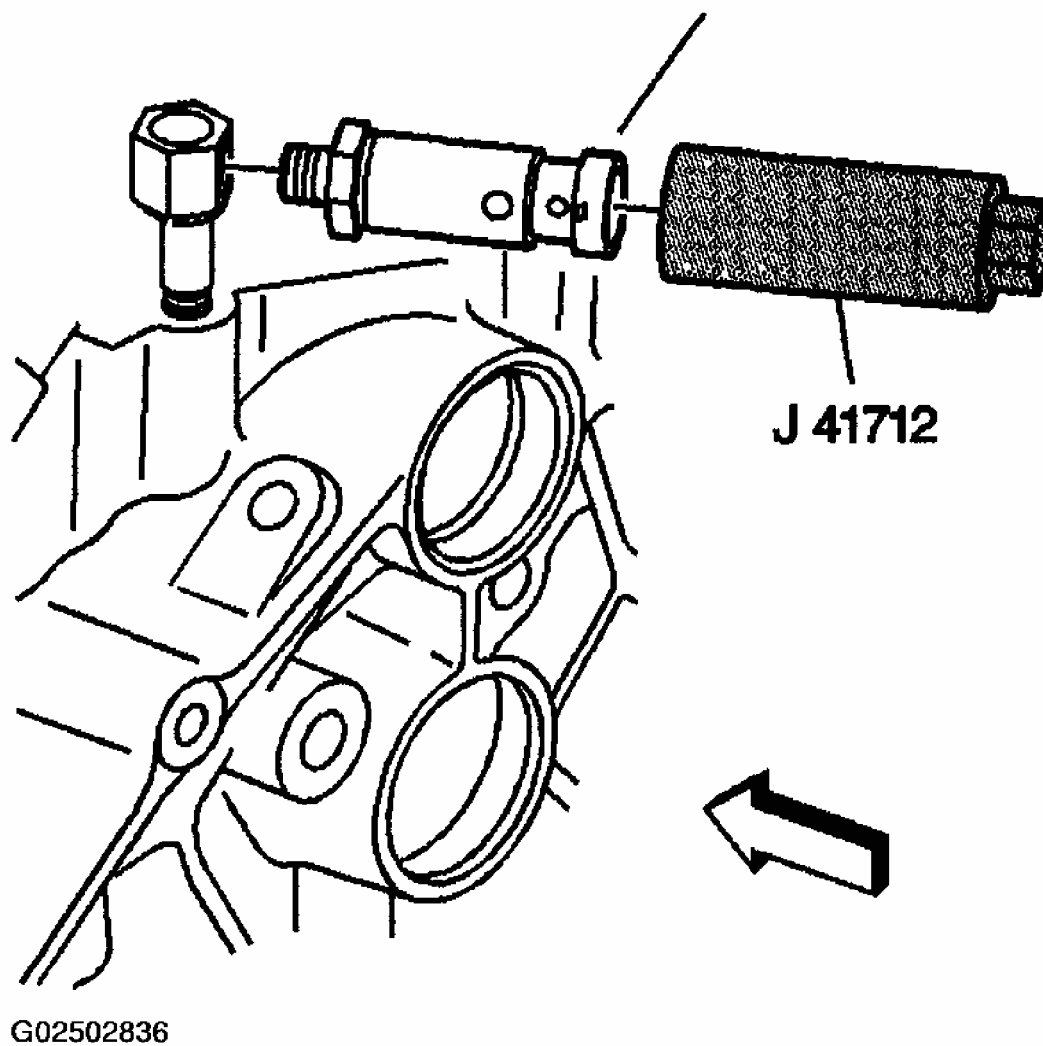
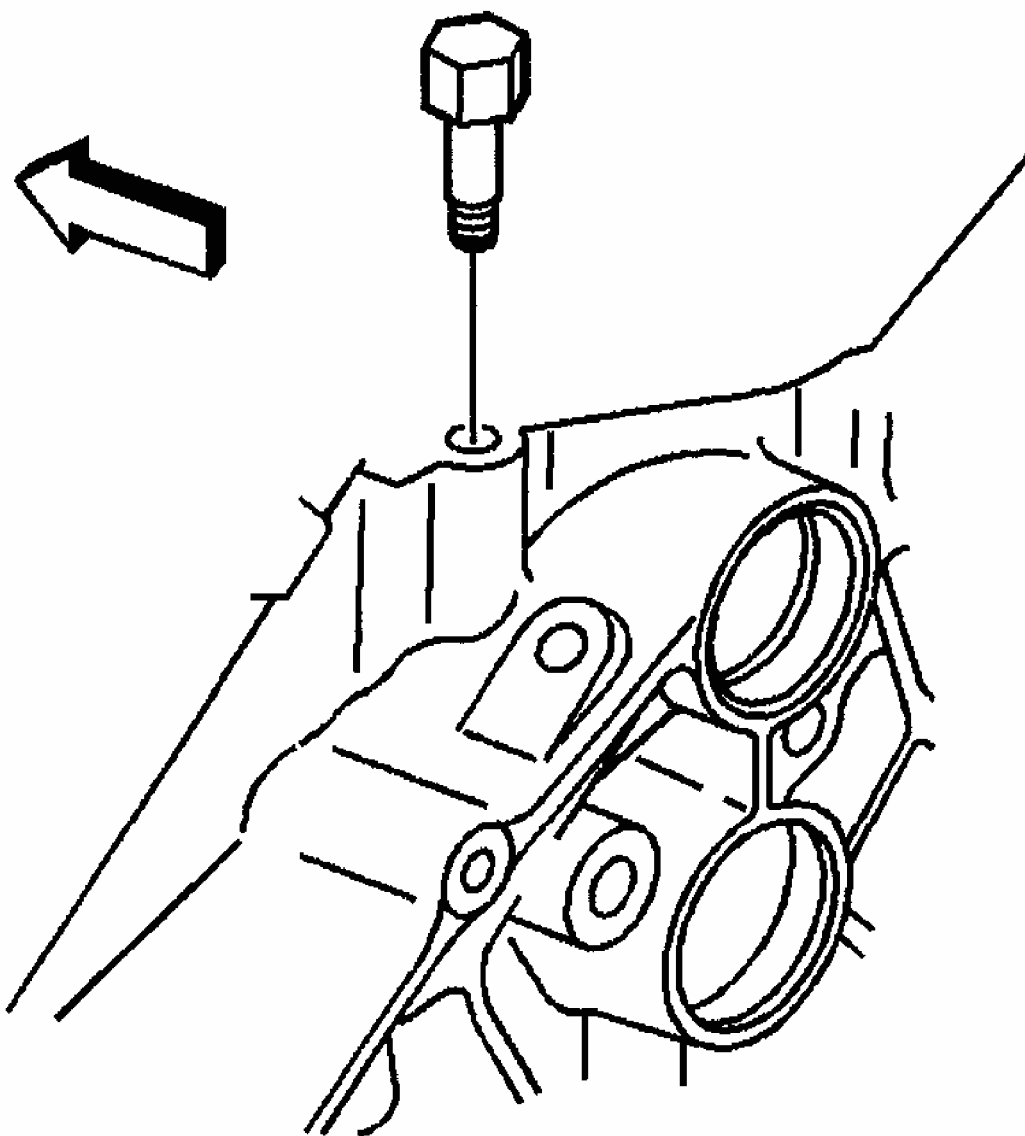


Fig. 102: Engine Oil Pressure Gage Sensor
Courtesy of GENERAL MOTORS CORP.

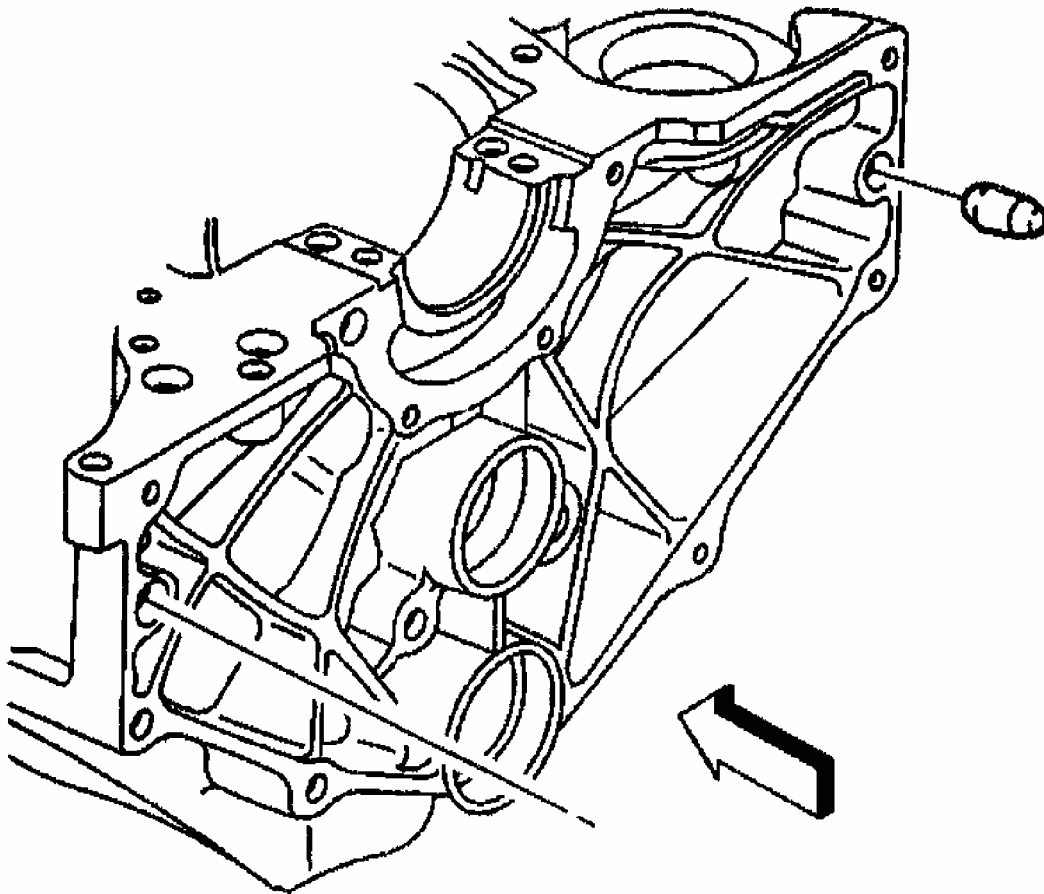
4. Remove the engine oil pressure sensor fitting.



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Fig. 103: Engine Oil Pressure Sensor Fitting
Courtesy of GENERAL MOTORS CORP.

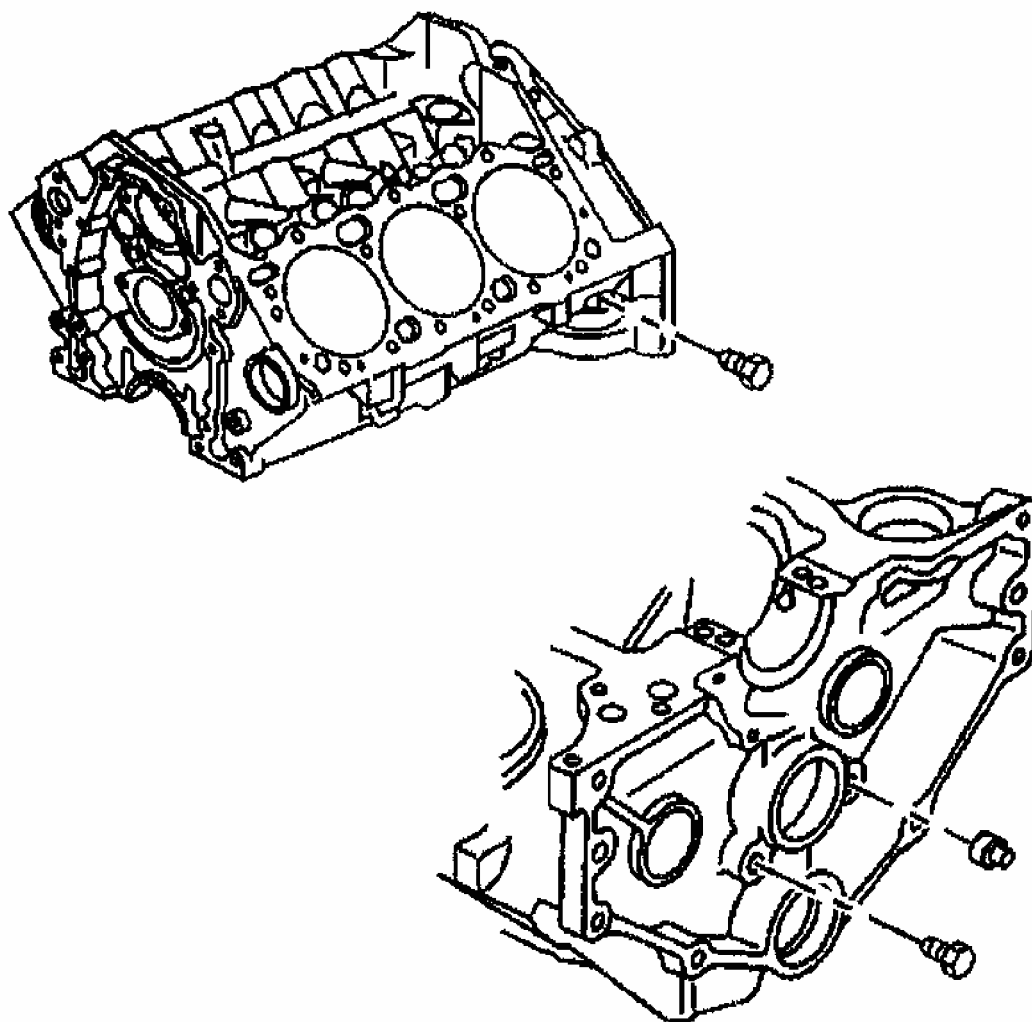
5. Remove the transmission locator dowel straight pins, if required.



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Fig. 104: Transmission Locator Dowel Straight Pins
Courtesy of GENERAL MOTORS CORP.

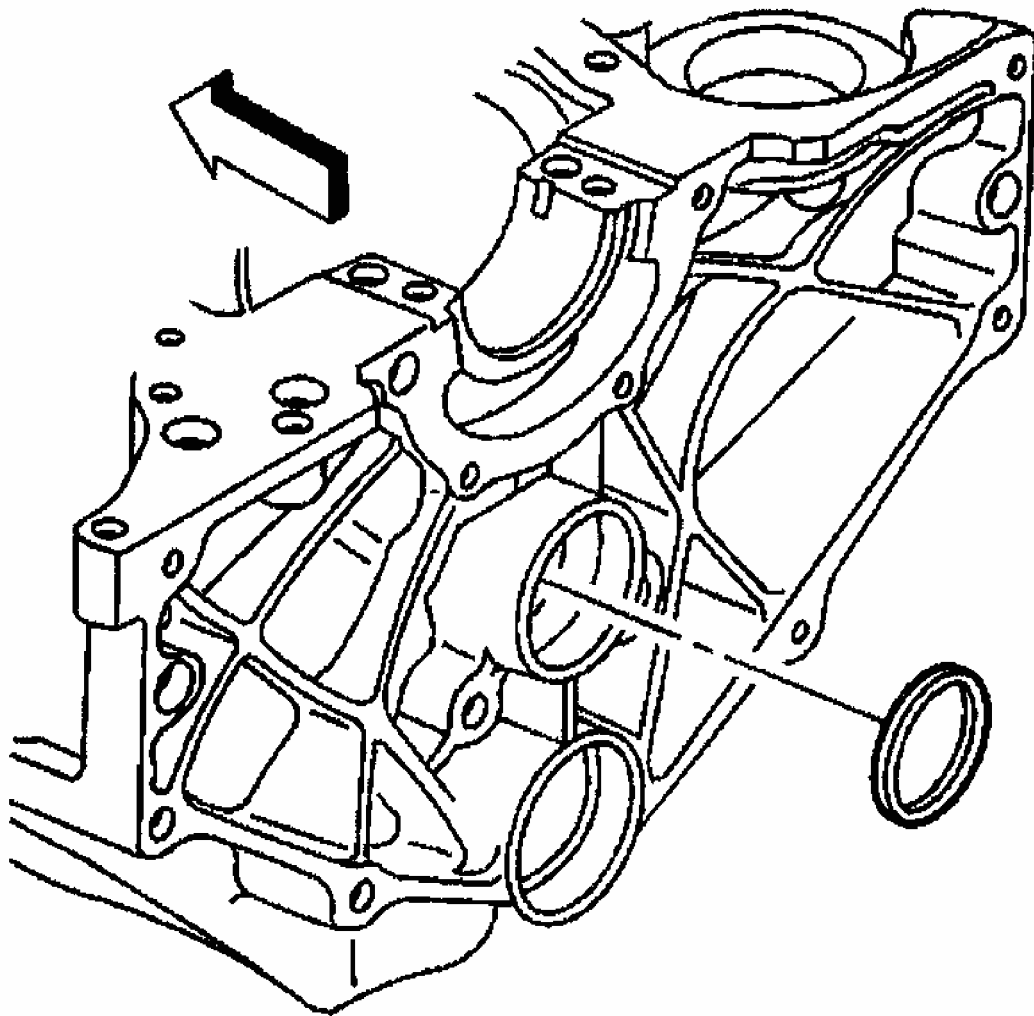
6. Remove the engine block left side oil gallery plug.
7. Remove the engine block left rear oil gallery plug.
8. Remove the engine block right rear oil gallery plug.



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Fig. 105: Engine Block Oil Gallery Plug
Courtesy of GENERAL MOTORS CORP.

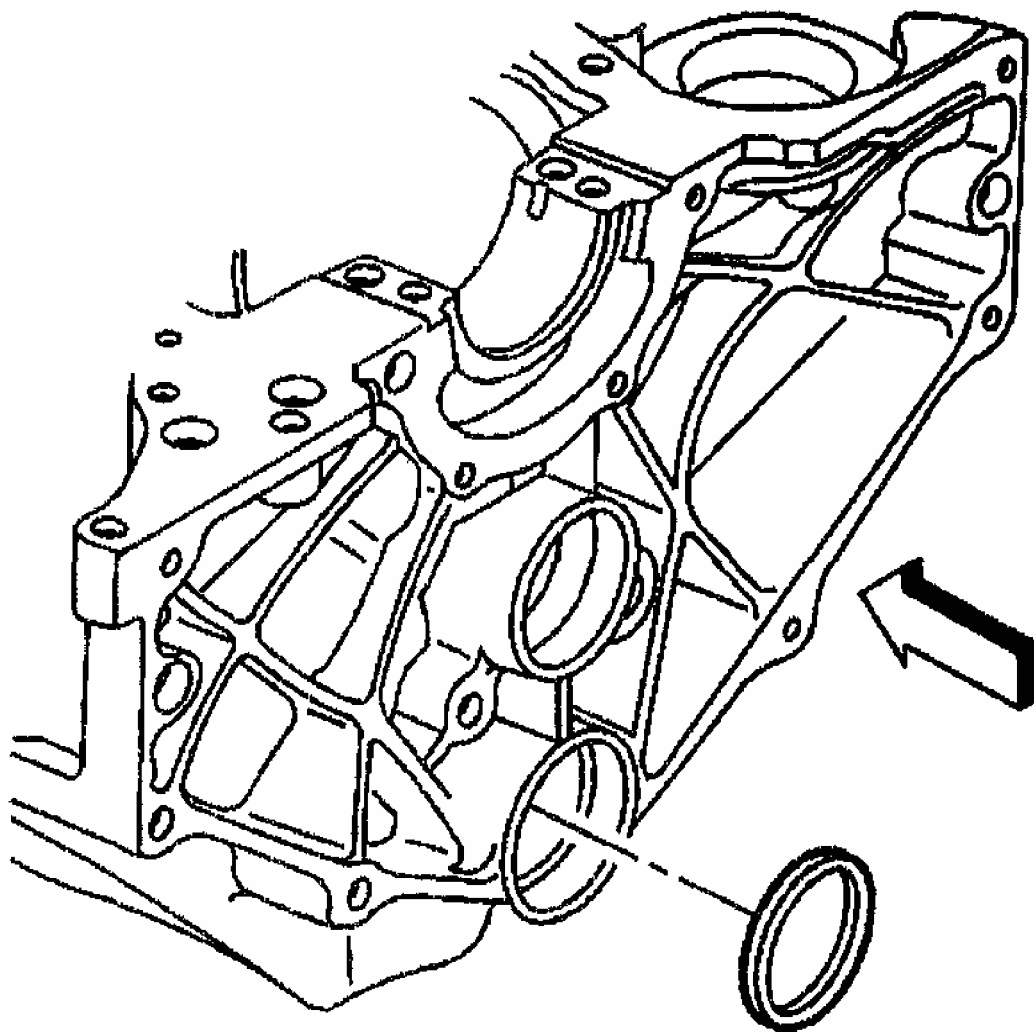
9. Remove the expansion cup plug from the camshaft rear bearing hole and discard.



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Fig. 106: Camshaft Rear Bearing Hole Expansion Cup Plug
Courtesy of GENERAL MOTORS CORP.

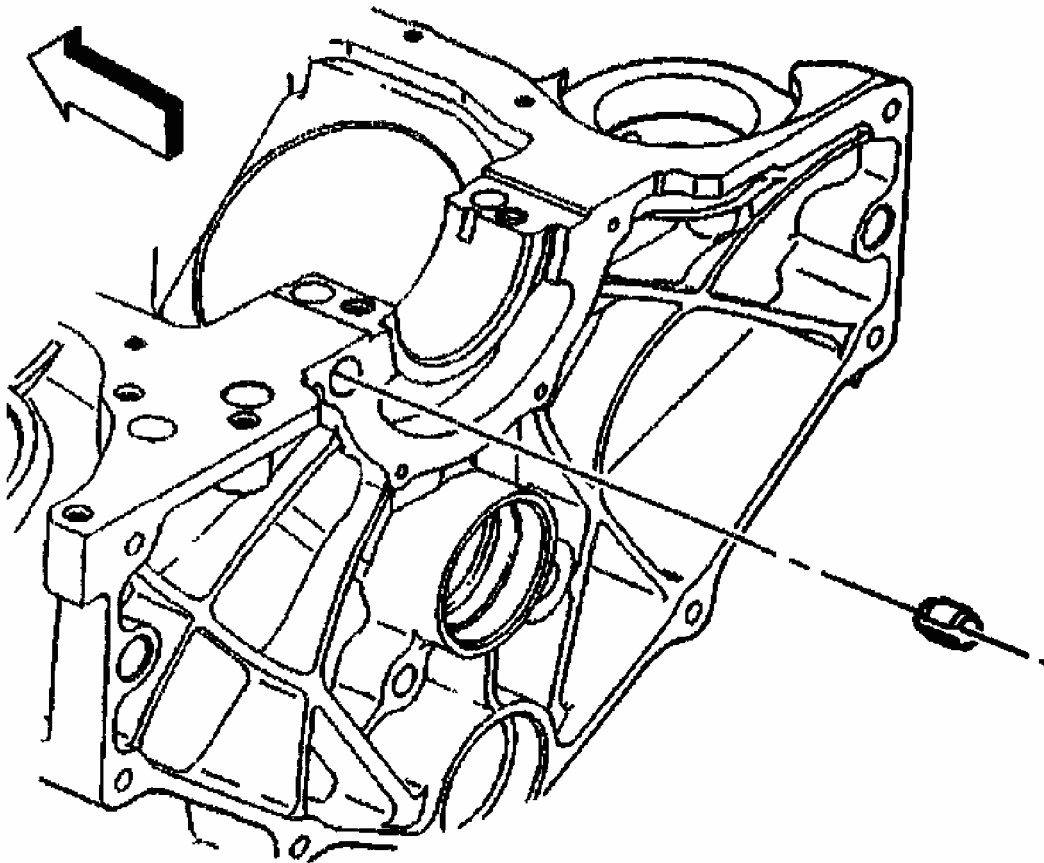
10. Remove the expansion cup plug from the balance shaft rear bearing hole and discard.



G02502841

Fig. 107: Balance Shaft Rear Expansion Cup Plug
Courtesy of GENERAL MOTORS CORP.

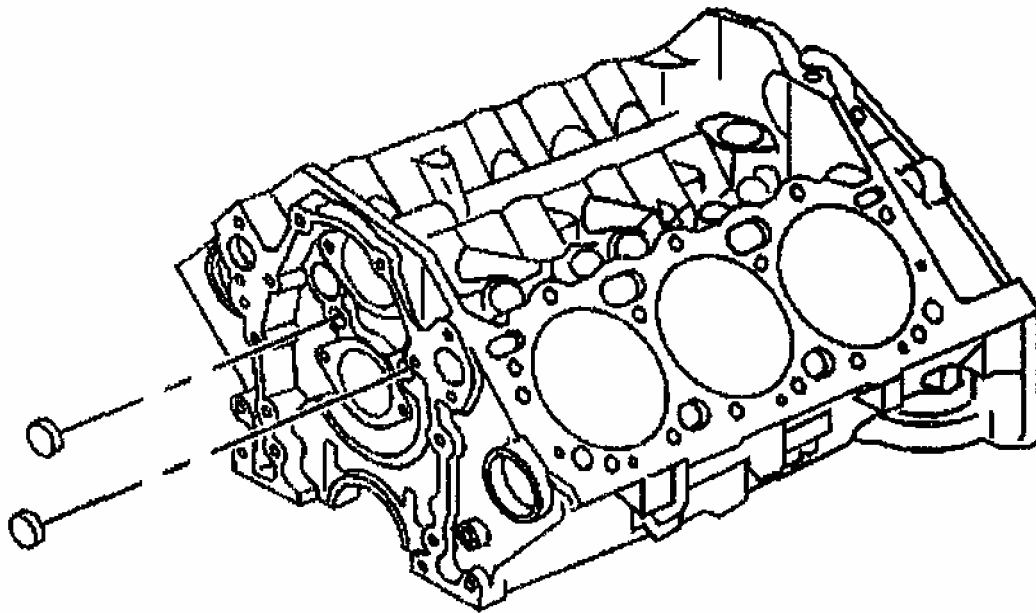
11. Remove the crankshaft rear oil seal housing locator spring type S pin, if required.



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Fig. 108: Crankshaft Rear Oil Seal Housing Locator Spring Type S Pin
Courtesy of GENERAL MOTORS CORP.

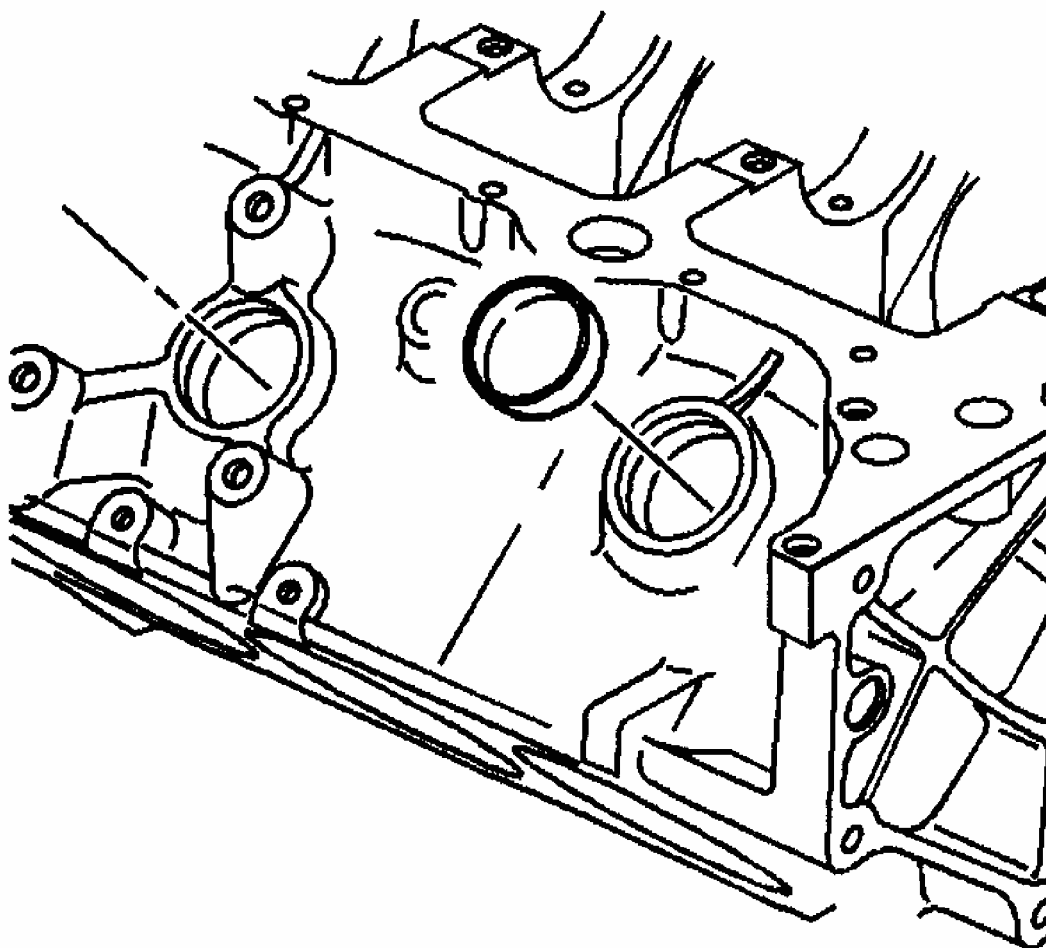
12. Remove the front oil gallery plugs or balls from the front of the engine block and discard. Insert a 3/8 x 26 inch rod into the rear oil gallery holes in order to drive out the front oil gallery plugs or balls.



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Fig. 109: Front Oil Gallery Plugs Or Balls
Courtesy of GENERAL MOTORS CORP.

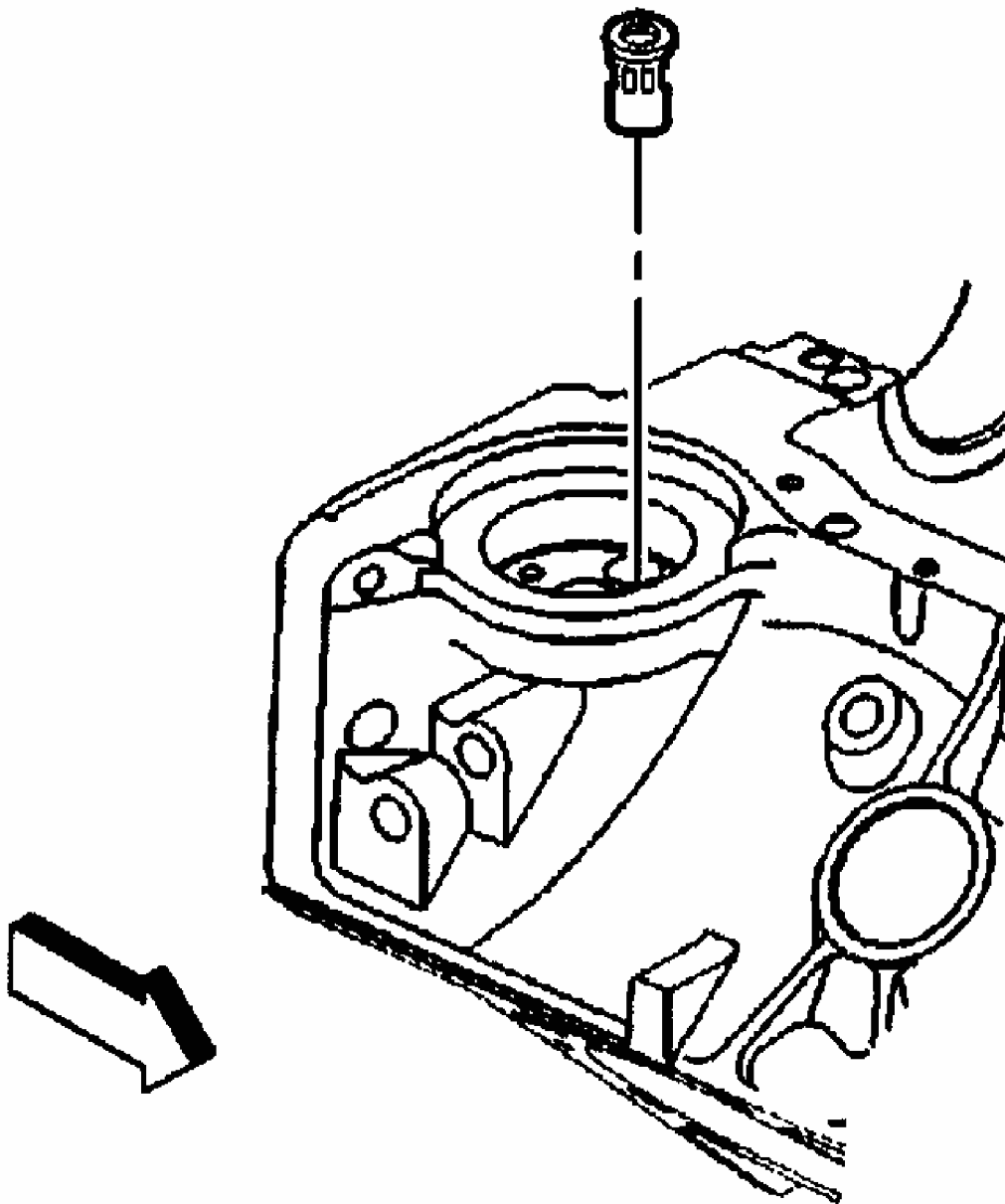
13. Remove the engine block core hole plugs.
 - 13.1. Use a suitable tool in order to drive the engine block core hole plugs into the coolant jacket.
 - 13.2. Use a suitable tool in order to pull the engine block core hole plugs from the coolant jacket.
 - 13.3. Discard the engine block core hole plugs.



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Fig. 110: Engine Block Core Hole Plugs
Courtesy of GENERAL MOTORS CORP.

14. Remove the oil filter bypass valve and discard.



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Fig. 111: Oil Filter Bypass Valve
Courtesy of GENERAL MOTORS CORP.

ENGINE BLOCK CLEANING & INSPECTION

Tools Required

J 8087 Cylinder Bore Gage

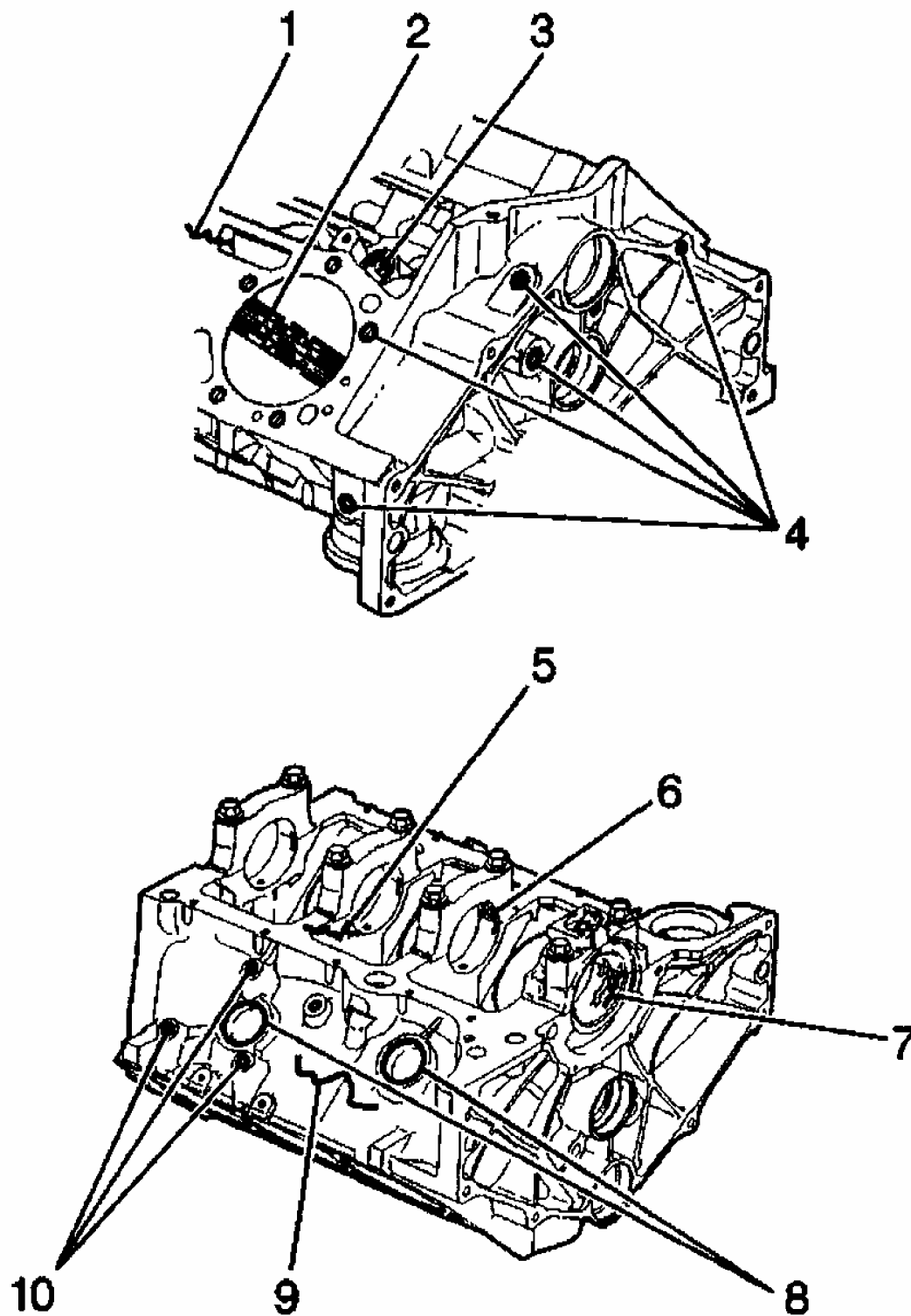
2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

1. Clean all the remaining sealing or gasket material from the sealing surfaces.
2. Clean the engine block with cleaning solvent.
3. Flush the engine block with clean water or steam.
4. Clean the cylinder bores.
5. Clean the oil galleries and the oil passages.
6. Clean the scale and the deposits from the coolant passages.

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

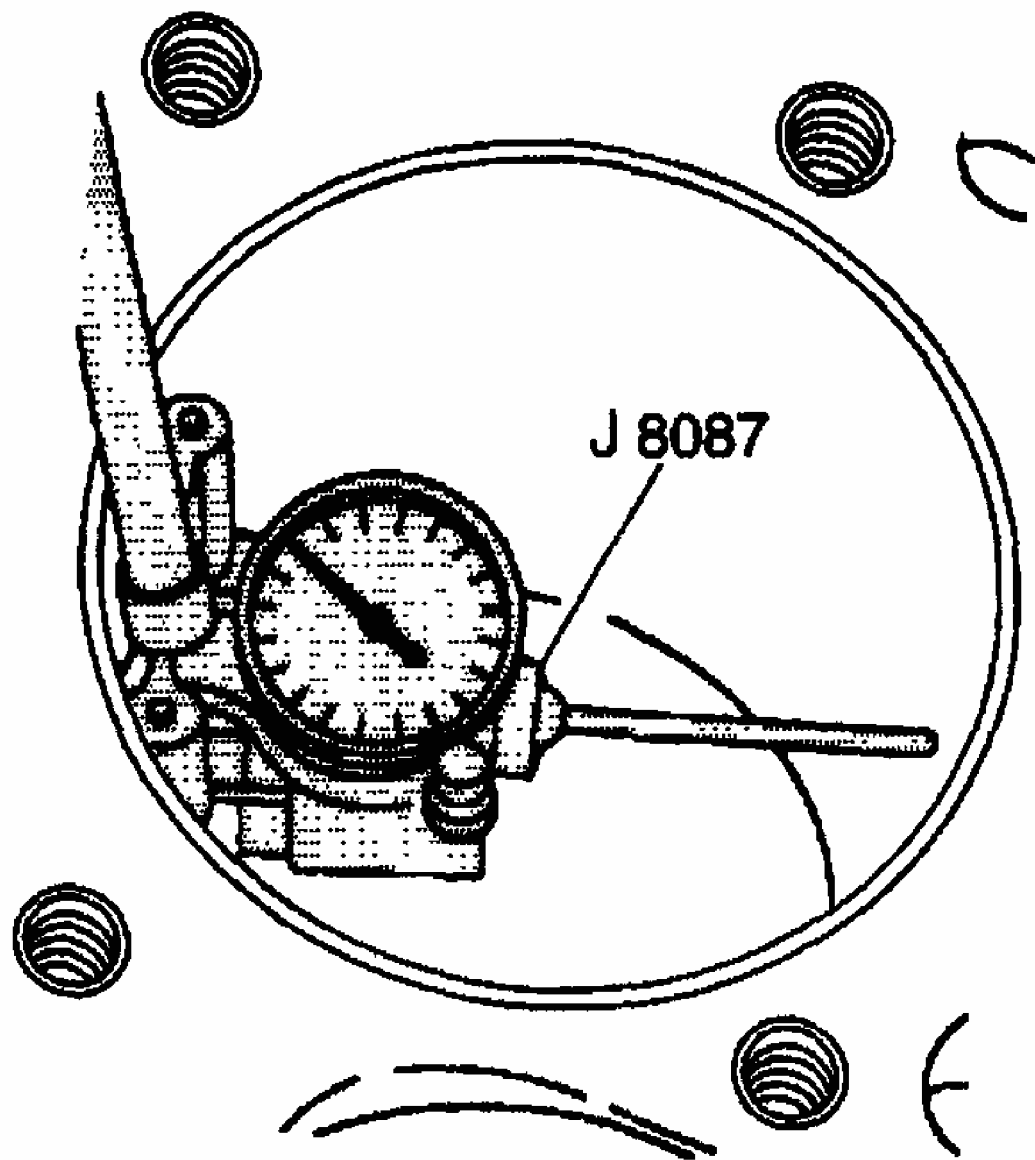


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Fig. 112: Oil Galleries & Oil Passages
Courtesy of GENERAL MOTORS CORP.

NOTE: Clean all dirt, debris, and coolant from the engine block cylinder head bolt holes. Failure to remove all foreign material may result in damaged threads, improperly tightened fasteners or damage to components.

7. Clean the engine block cylinder head bolt holes.
8. After cleaning the engine block, spray or wipe the cylinder bores and the machined surfaces with clean engine oil.
9. Inspect the following areas:
 - Coolant jackets (1) for cracks
 - Cylinder bores (2) for scratches or gouging
 - Valve lifter bores (3) for excessive scoring or wear
 - Threaded holes (4) for damage
 - Crankshaft bearing webs (5) for cracks
 - Crankshaft bearing caps (6) and the crankshaft bearing bores (7) for damage
 - The crankshaft bearing bores should be round and uniform when measuring the inside diameter (ID).
 - The surface where the crankshaft bearings contact the crankshaft bearing bore should be smooth.
 - If a crankshaft bearing cap is damaged and requires replacement, replace the crankshaft bearing cap first, then rebore the engine block crankshaft bearing bores and check for the proper alignment. Finally, check the crankshaft for the proper clearances.
 - Engine block core hole plug bores (8) for damage
 - Engine block (9) for cracks or damage
 - Engine mount bosses (10) for damage
10. Measure the cylinder bores for taper and out-of-round.
 - 10.1. Depress the plunger on the **J 8087** to 7 mm (0.275 in) or until the **J 8087** enters the cylinder bore.
 - 10.2. Center the **J 8087** in the cylinder bore and turn the indicator dial to 0.
 - 10.3. Move the **J 8087** up and down the cylinder bore to determine the cylinder bore taper. Refer to **Engine Mechanical Specifications**.
 - 10.4. Turn the **J 8087** to different points around the cylinder bore to determine the cylinder bore out-of-round condition. Refer to **Engine Mechanical Specifications**.

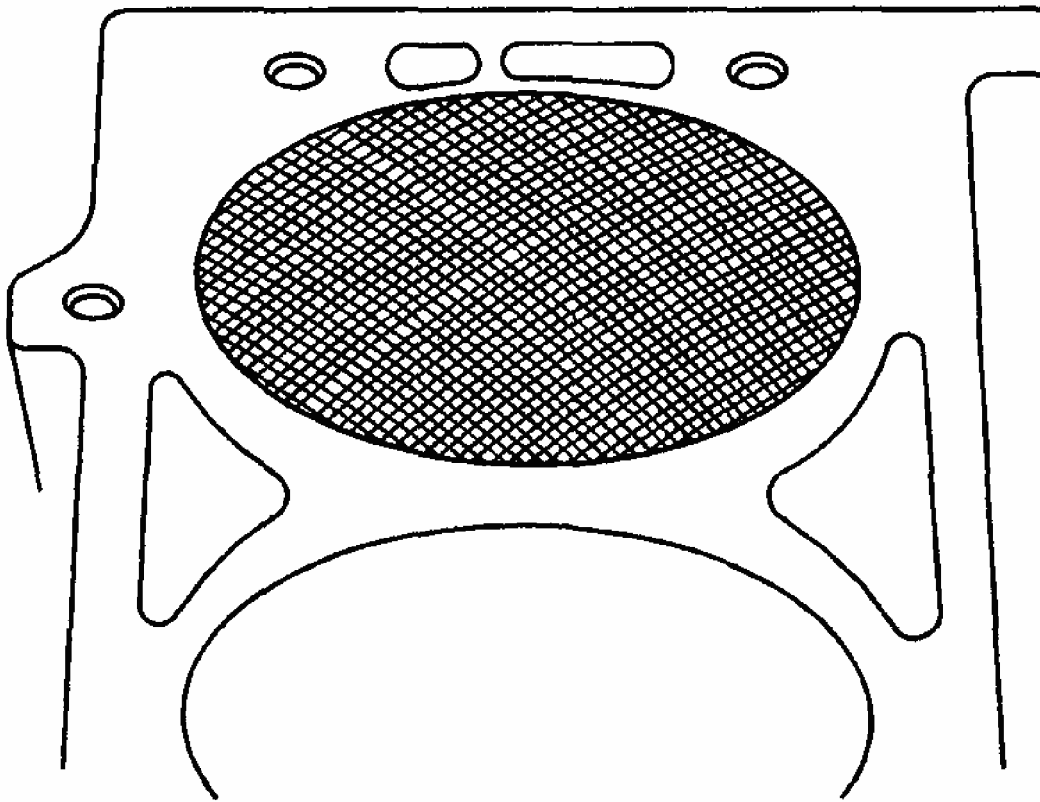


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Fig. 113: Checking Cylinder Bore Out-Of-Round
Courtesy of GENERAL MOTORS CORP.

CYLINDER BORING & HONING

Honing Procedure



G02502848

Fig. 114: Cylinder Boring & Honing
Courtesy of GENERAL MOTORS CORP.

1. When honing the cylinder bores, follow the manufacturer's recommendations for equipment use, cleaning, and lubrication.
 - Use only clean sharp stones of the proper grade for the amount of material to be removed.
 - Dull, dirty stones cut unevenly and generate excessive heat.
 - DO NOT hone to a final grade with a coarse or medium-grade stone.
 - Leave sufficient metal so that all the stone marks will be removed with the fine grade stones.
 - Perform the final honing with a fine-grade stone and hone the cylinder bore in a cross hatch pattern at 45-65 degrees to obtain the proper clearance.
2. During the honing operation, thoroughly check the cylinder bore.
 - Repeatedly check the cylinder bore fit with the selected piston.
 - All measurements of the piston or cylinder bore should be made with the components at normal room temperature.

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

3. When honing to eliminate taper in the cylinder bore, use full strokes the complete length of the cylinder bore.

Repeatedly check the measurement at the top, the middle, and the bottom of the cylinder bore.

- The finish marks should be clean but not sharp.
 - The finish marks should be free from imbedded particles or torn or folded metal.
4. When finished, the reconditioned cylinder bores should have less than or meet the specified out-of-round and taper requirements.
 5. After the final honing and before the piston is checked for fit, clean the cylinder bore with hot water and detergent.
 - 5.1. Scrub the cylinder bores with a stiff bristle brush.
 - 5.2. Rinse the cylinder bores thoroughly with clean hot water.
 - 5.3. Dry the cylinder bores with a clean rag.
 - 5.4. Do not allow any abrasive material to remain in the cylinder bores.
 - Abrasive material may cause premature wear of the new piston rings and the cylinder bores.
 - Abrasive material will contaminate the engine oil and may cause premature wear of the bearings.
 6. Perform final measurements of the piston and the cylinder bore.
 7. Permanently mark the top of the piston for the specified cylinder to which it has been fitted.
 8. Apply clean engine oil to each cylinder bore in order to prevent rusting.

Boring Procedure

1. Before starting the honing or reboring operation, measure all the new pistons with the micrometer contacting at points exactly 90 degrees from the piston pin centerline.
2. File the top of the cylinder block in order to remove any dirt or burrs before using any type of boring bar.
3. Follow the instructions furnished by the manufacturer regarding use of the boring equipment.
4. When reboring the cylinders, make sure all the crankshaft bearing caps are installed in the original position and direction.
5. Tighten the crankshaft bearing caps to the proper torque specifications in order to avoid distortion of the cylinder bores in the final assembly.
6. When making the final cut with the boring bar, leave 0.03 mm (0.001 in) on the cylinder bore diameter for finish honing. This gives the required position to the cylinder clearance specifications. Carefully perform the honing and boring operation in

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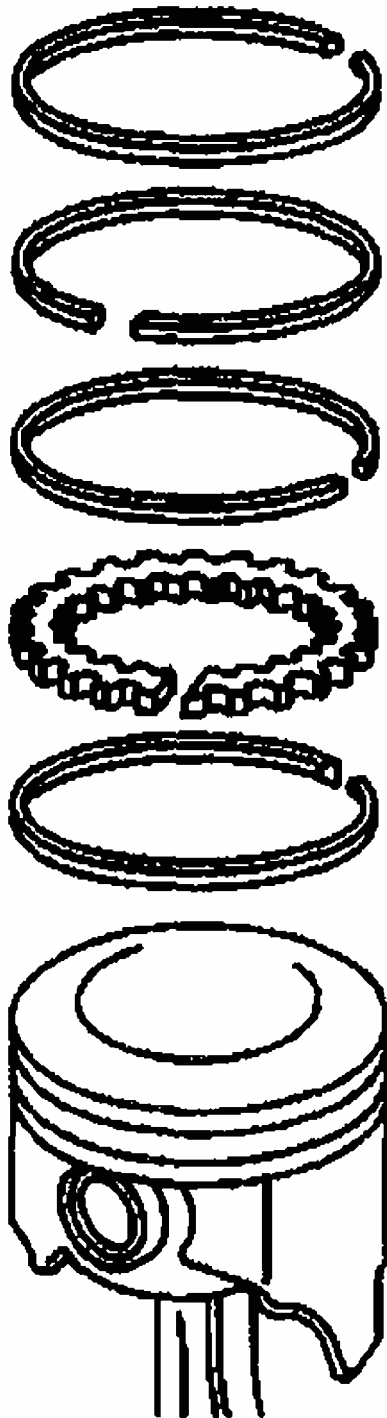
order to maintain the specified clearances between the pistons, the piston rings, and the cylinder bores.

PISTON & CONNECTING ROD DISASSEMBLE

Tools Required

J 24086-C Piston Pin Remover/Installer

1. Remove the piston rings from the pistons.



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Fig. 115: Piston Rings
Courtesy of GENERAL MOTORS CORP.

2. Press the piston pin from the connecting rod using the **J 24086-C** . The piston pin has an interference fit into the connecting rod, and is full floating in the piston.

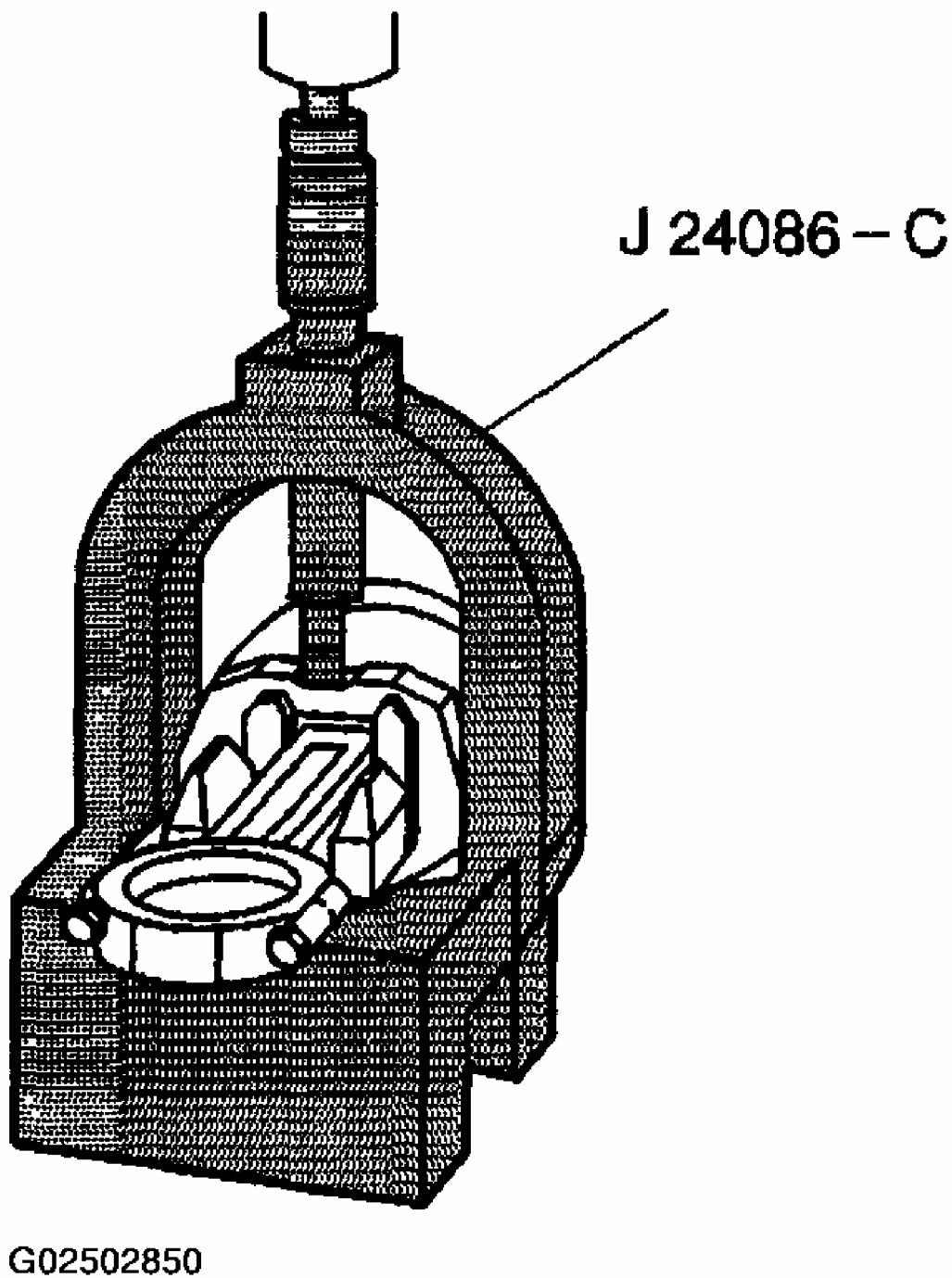
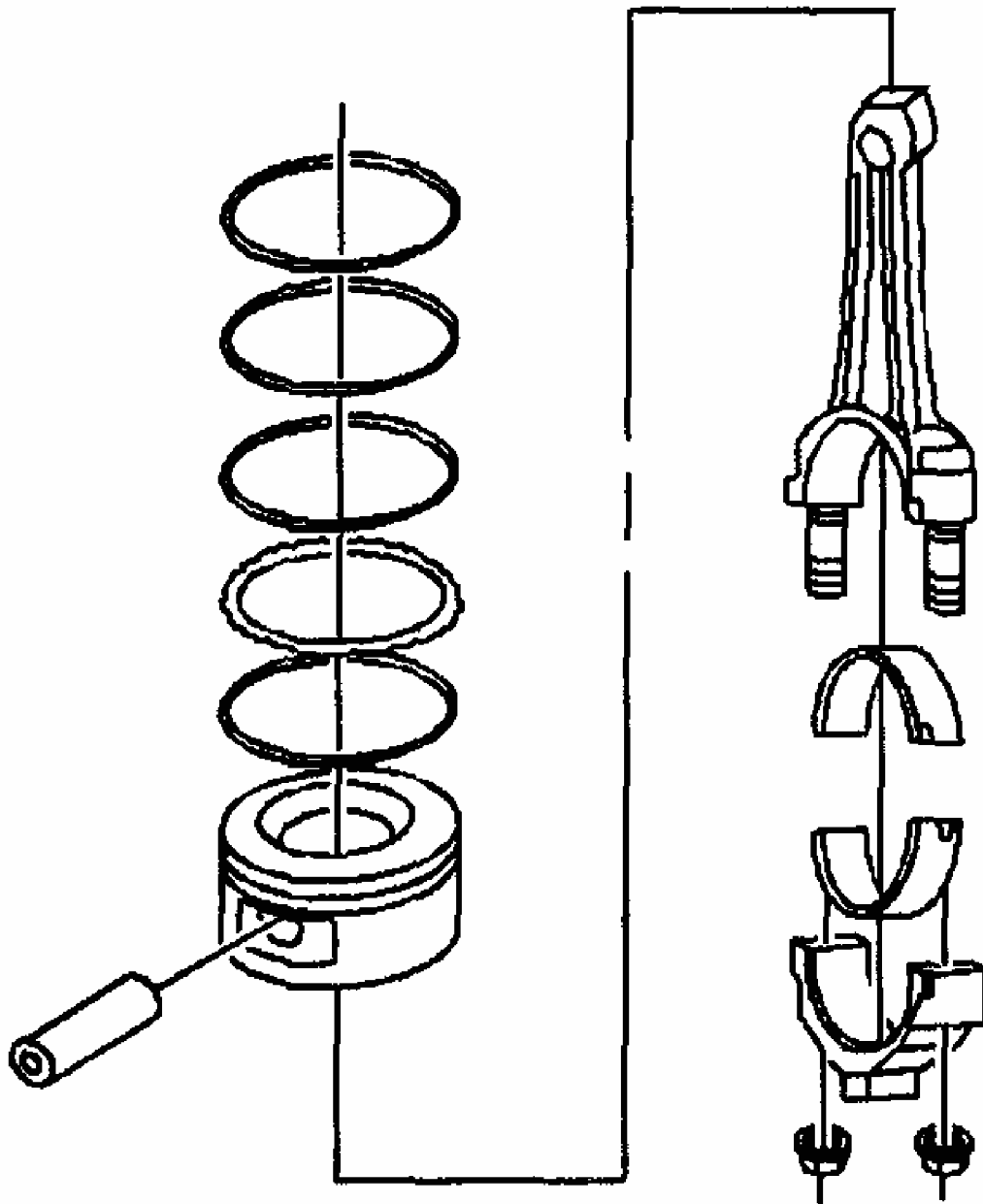


Fig. 116: Pressing Piston Pin From Connecting Rod
Courtesy of GENERAL MOTORS CORP.

3. Mark, separate, and organize the parts for assembly.



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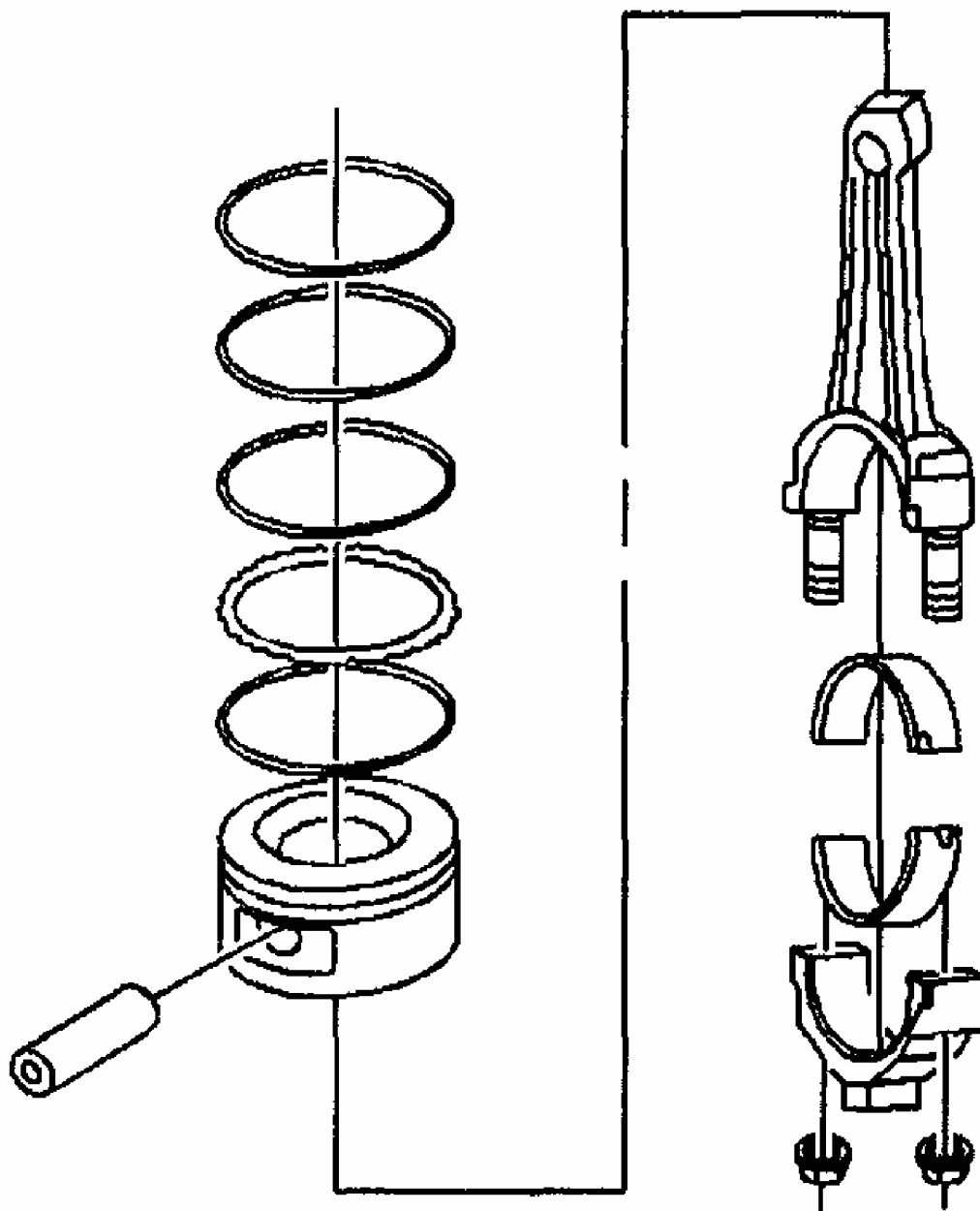
Fig. 117: Organizing Parts For Assembly
Courtesy of GENERAL MOTORS CORP.

PISTON, CONNECTING ROD & BEARINGS CLEANING & INSPECTION

Important: Measurement of all components should be taken with the components at room temperature.

Do not use a wire brush in order to clean any part of the piston.

1. Clean the piston and connecting rod in solvent.
2. Dry the components with compressed air.

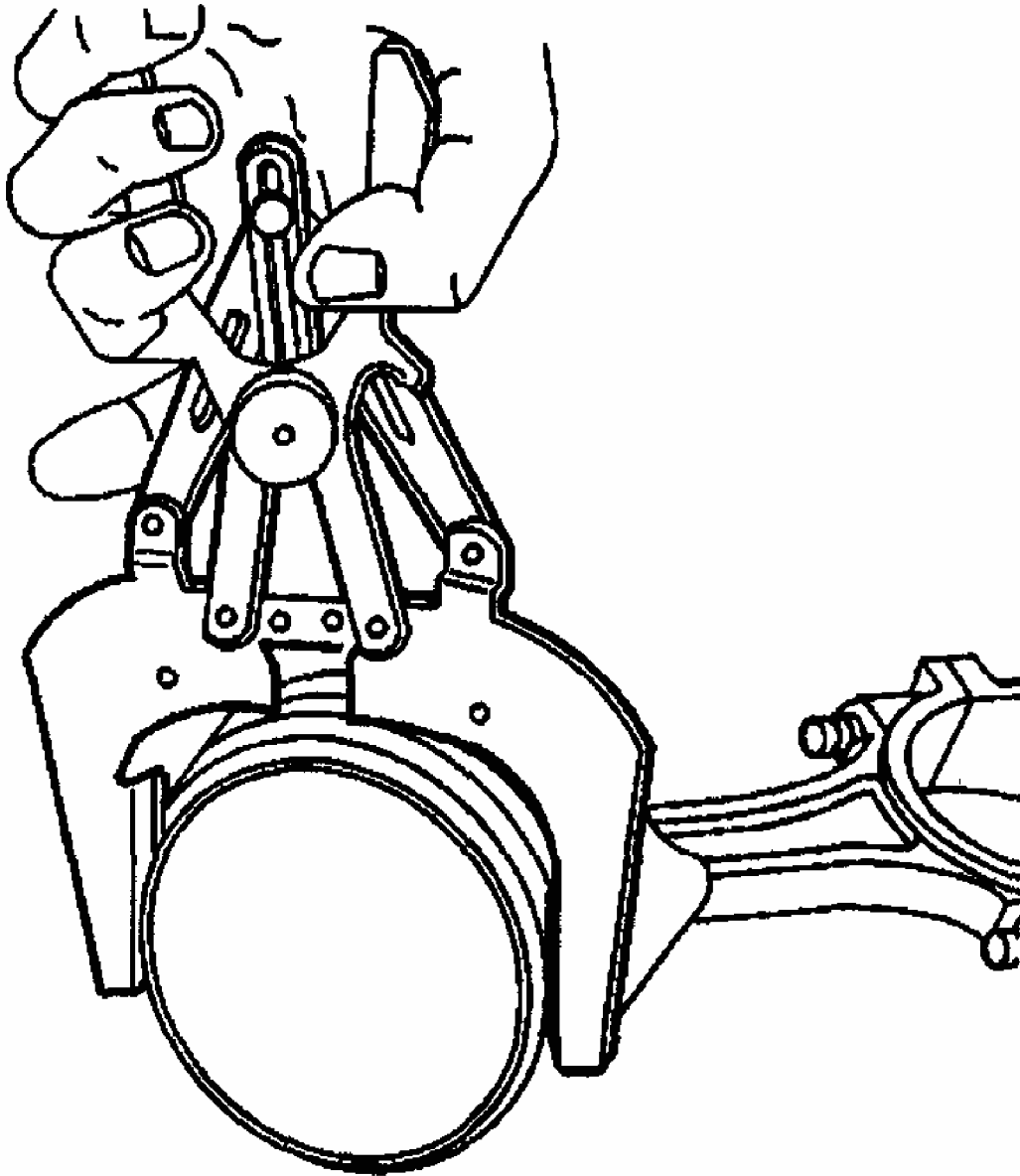


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Fig. 118: Piston, Connecting Rod & Bearings

Courtesy of GENERAL MOTORS CORP.

3. Clean the piston ring grooves with a suitable ring groove cleaning tool.



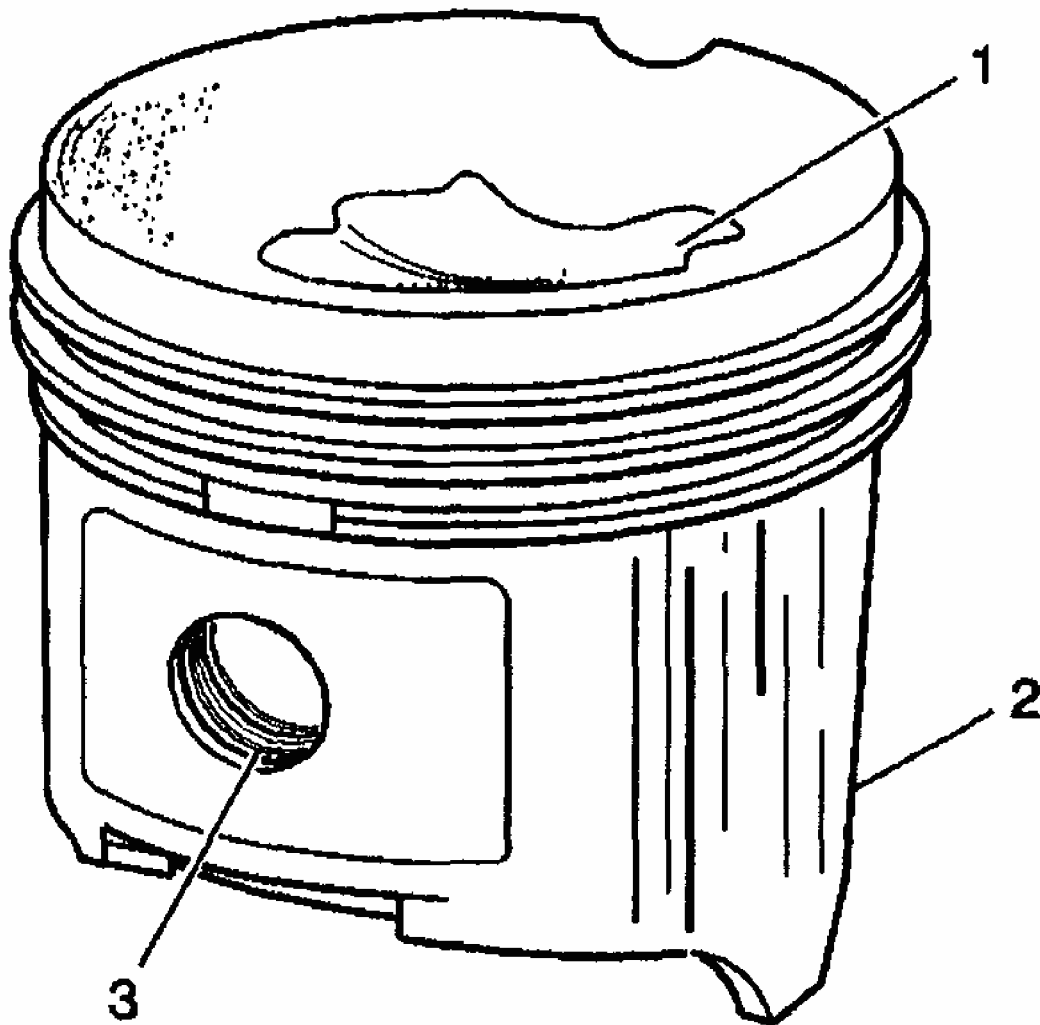
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Fig. 119: Cleaning Piston Ring Grooves
Courtesy of GENERAL MOTORS CORP.

4. Clean the piston oil lubrication holes and slots.
5. Inspect the piston for the following:

- Eroded areas (1) on the top of the piston
- Scuffed or damaged skirt (2)
- Damage to the pin bore (3)
- Cracks in the piston ring lands, the piston skirt, or the pin bosses
- Piston ring grooves for nicks, burrs, or other warpage which may cause the piston ring to bind

6. Inspect the piston pin for scoring, wear or other damage.

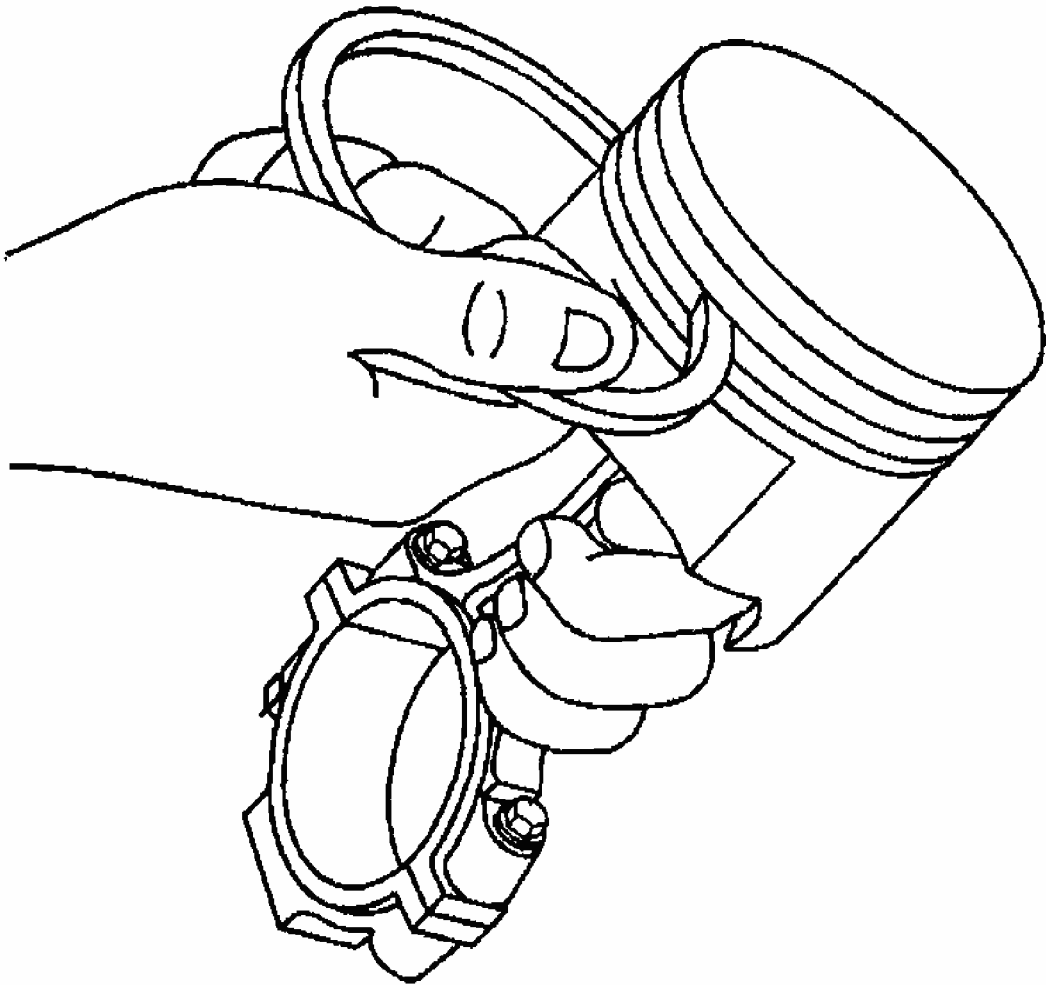


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Fig. 120: Inspecting Piston Pin For Scoring, Wear Or Other Damage
Courtesy of GENERAL MOTORS CORP.

7. Measure the piston ring-to-piston ring groove side clearance.

- 7.1. Insert the edge of the piston ring into the piston ring groove.
- 7.2. Roll the piston ring completely around the piston.
 - If binding is caused by a distorted piston ring groove, MINOR imperfections may be removed with a fine file.
 - If binding is caused by a distorted piston ring, replace the piston ring.

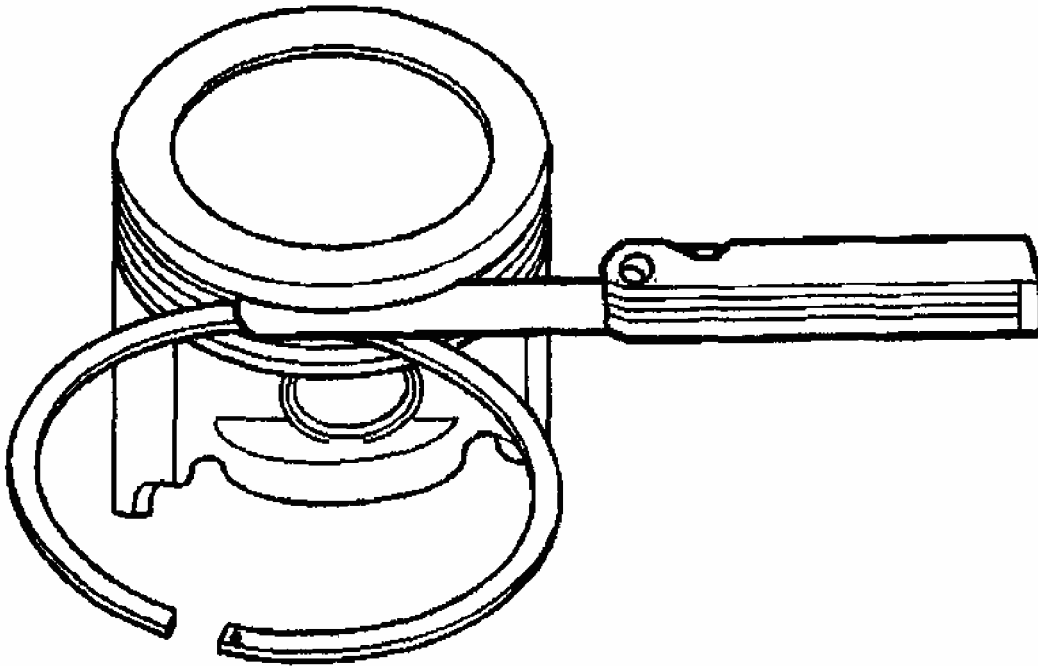


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Fig. 121: Measuring Piston Ring-To-Piston Ring Groove Side Clearance
Courtesy of GENERAL MOTORS CORP.

8. Measure the piston ring side clearance with a feeler gauge.
9. If the side clearance is too small, try another piston ring set.
10. If the proper piston ring-to-piston ring groove clearance cannot be achieved, replace the piston and pin assembly.

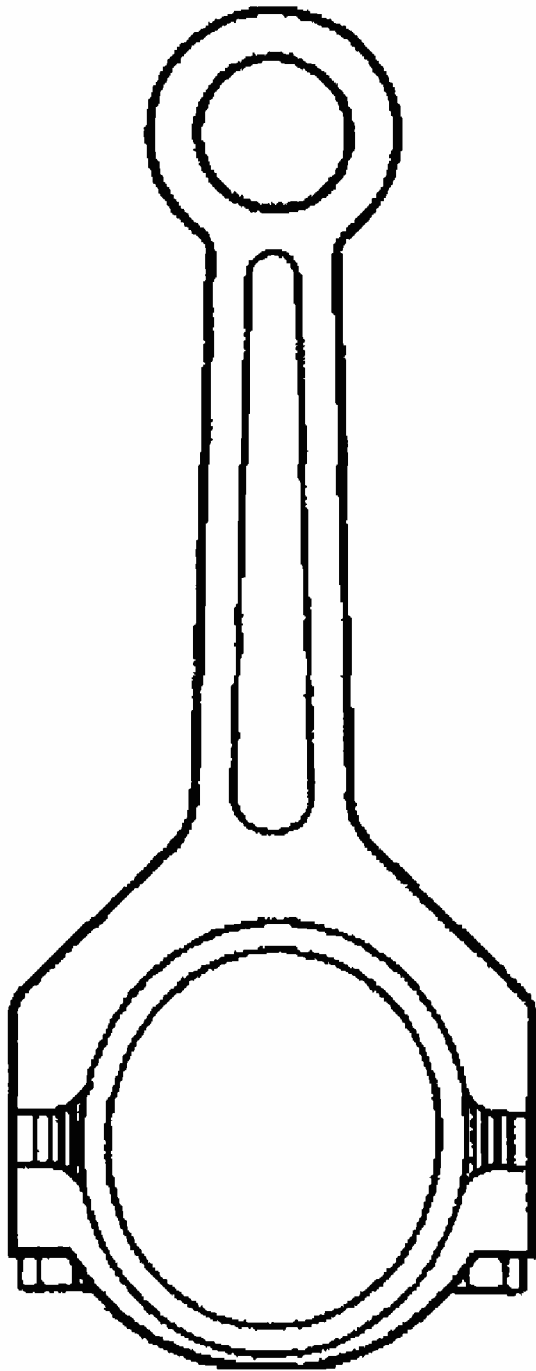
11. To determine the proper piston ring side clearance, refer to **Engine Mechanical Specifications** .



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Fig. 122: Determining Proper Piston Ring Side Clearance
Courtesy of GENERAL MOTORS CORP.

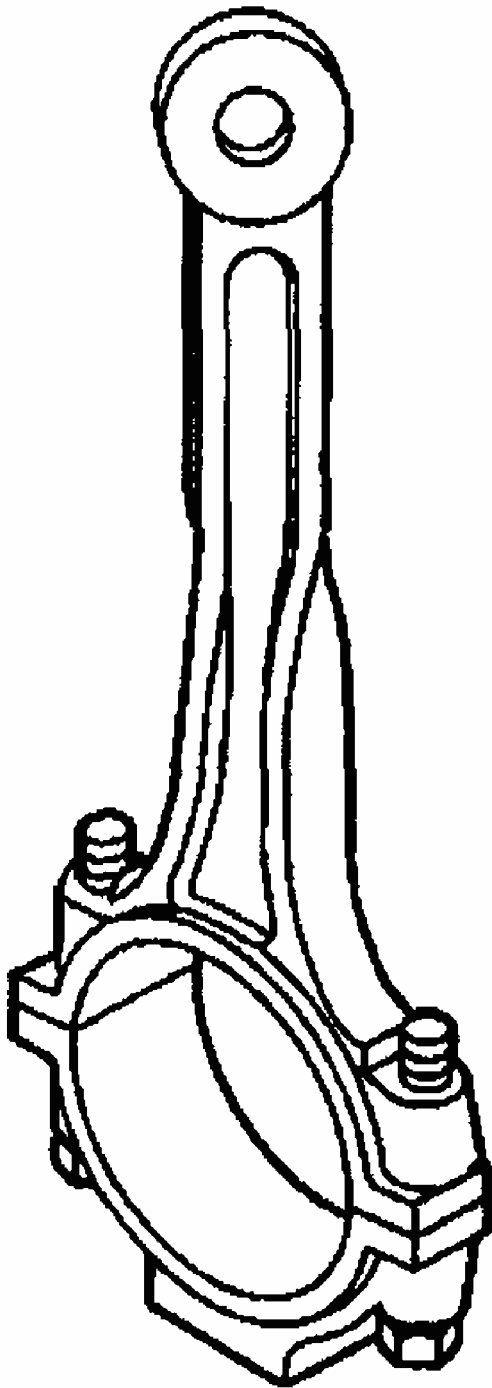
12. Inspect the connecting rod for an out-of-round bearing bore. Refer to **Engine Mechanical Specifications** .



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Fig. 123: Inspecting Connecting Rod For An Out-Of-Round Bearing Bore
Courtesy of GENERAL MOTORS CORP.

13. Inspect the connecting rod for twisting.



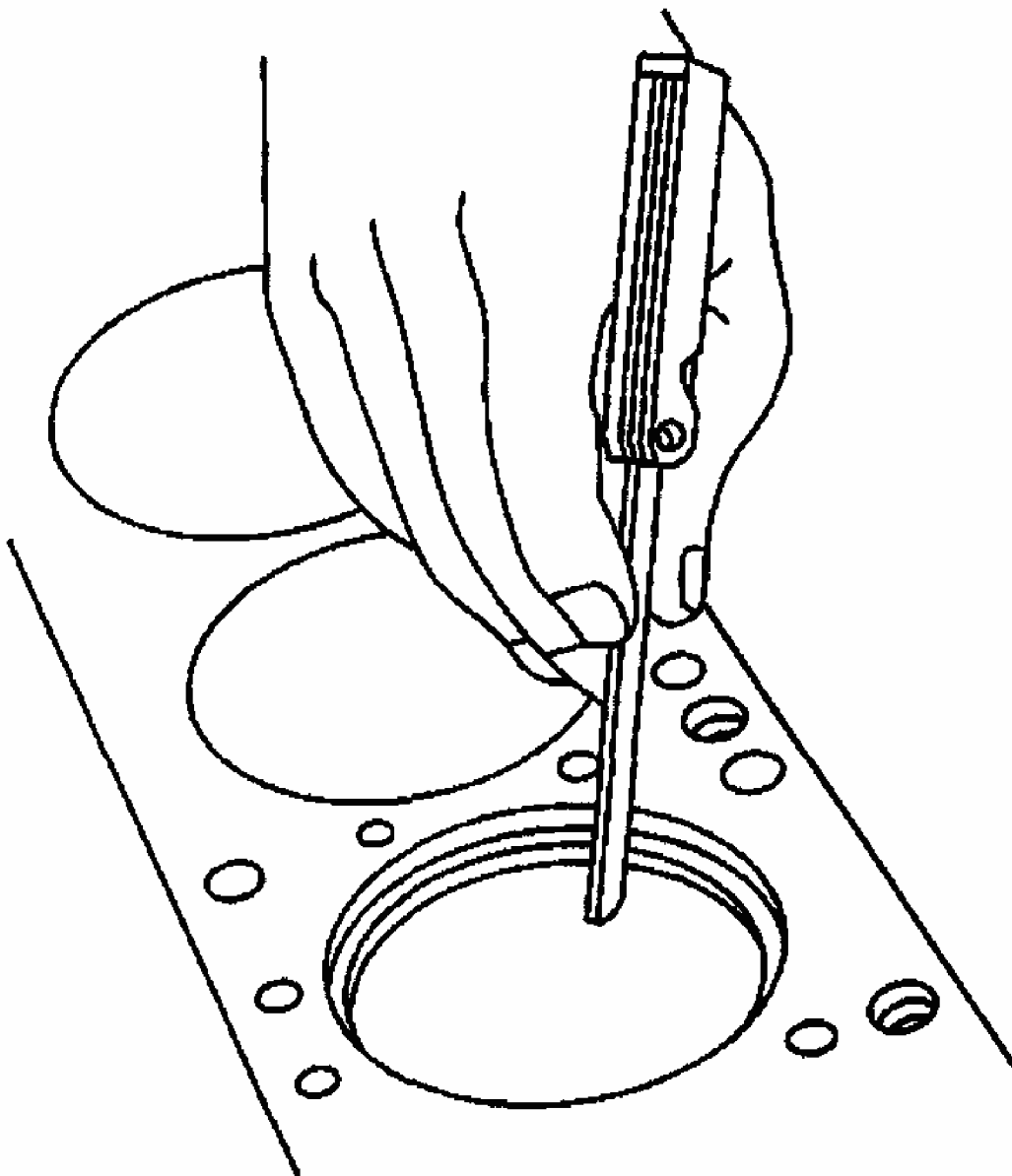
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Fig. 124: Inspecting Connecting Rod For Twisting
Courtesy of GENERAL MOTORS CORP.

14. Inspect the connecting rod for damage to the bearing cap and bolt threads.
15. Measure the piston compression ring end gap.

Important: Fit each compression ring to the cylinder in which it will be used.

- 15.1. Place the compression ring into the cylinder bore.
- 15.2. Push the compression ring into the cylinder bore to approximately 6.5 mm (0.25 in) above the ring travel. The ring must be square to the cylinder wall.
- 15.3. Use a feeler gage in order to measure the end gap.
- 15.4. Select another size ring set if the end gap exceeds specifications. Refer to **Engine Mechanical Specifications** .



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Fig. 125: Measure Piston Ring End Gap

2001 Chevrolet S10 Pickup
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Courtesy of GENERAL MOTORS CORP.

PISTON & CONNECTING ROD ASSEMBLE

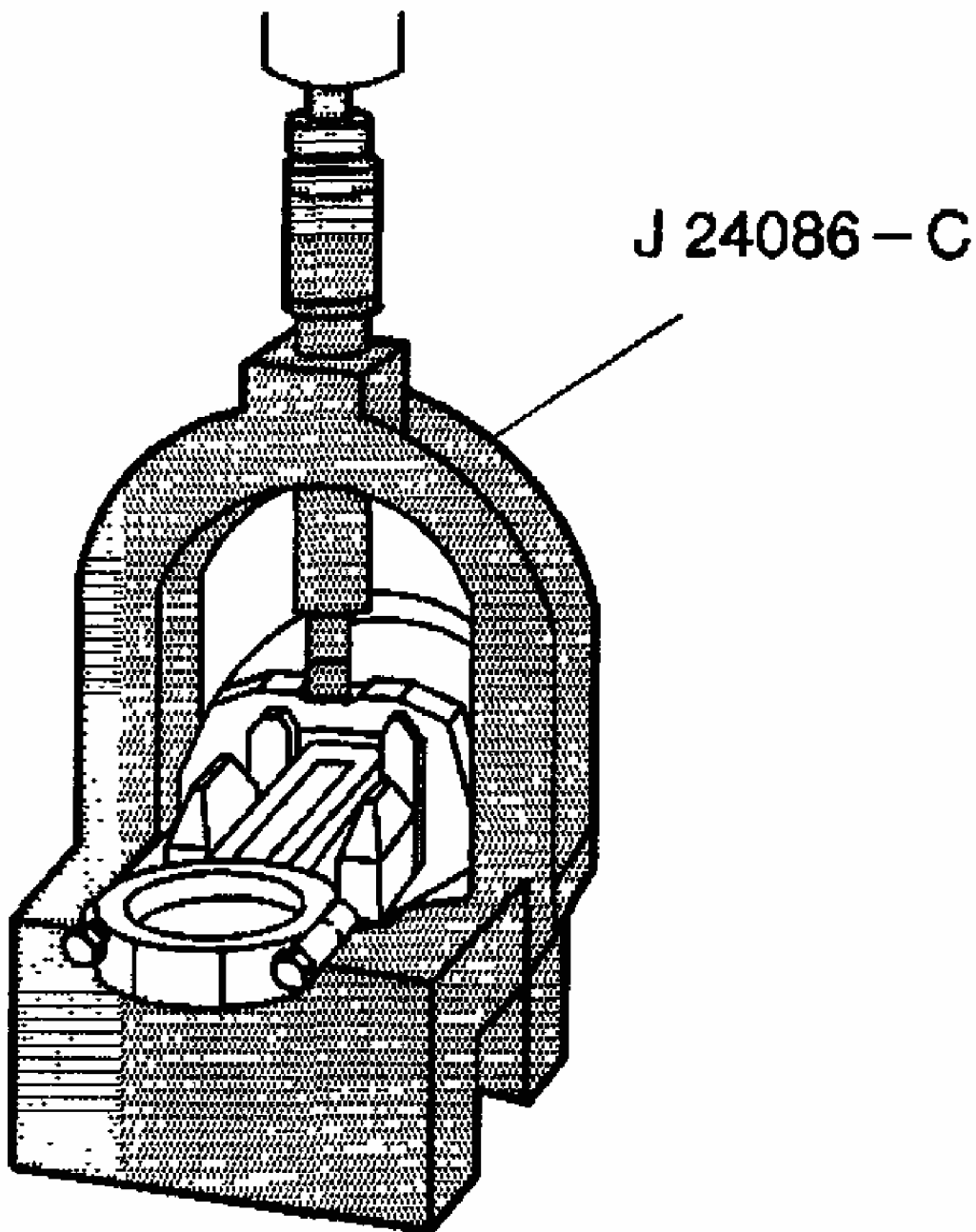
Tools Required

J 24086-C Piston Pin Remover/Installer

CAUTION: Avoid contact with HOT components. Wear safety glasses and protective gloves to avoid personal injury.

NOTE: Applying excessive heat to the connecting rod may damage or distort the rod. Rod temperature **SHOULD NOT** exceed 315°C (600°F). At this temperature the end of the connecting rod will turn a straw color upon visual inspection.

NOTE: After the J 24086-C installer hub bottoms on the support assembly, **DO NOT** exceed 35,000 kPa (5,000 psi) or the tool may be damaged.



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Fig. 126: Piston Pin Remover/Installer
Courtesy of GENERAL MOTORS CORP.

Important: When assembling the piston and connecting rod, the mark on the top of the piston must point to the front of the engine block. The left bank connecting rods should have

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the flange face toward the front of the engine block. The right bank connecting rods should have the flange face toward the rear of the engine block.

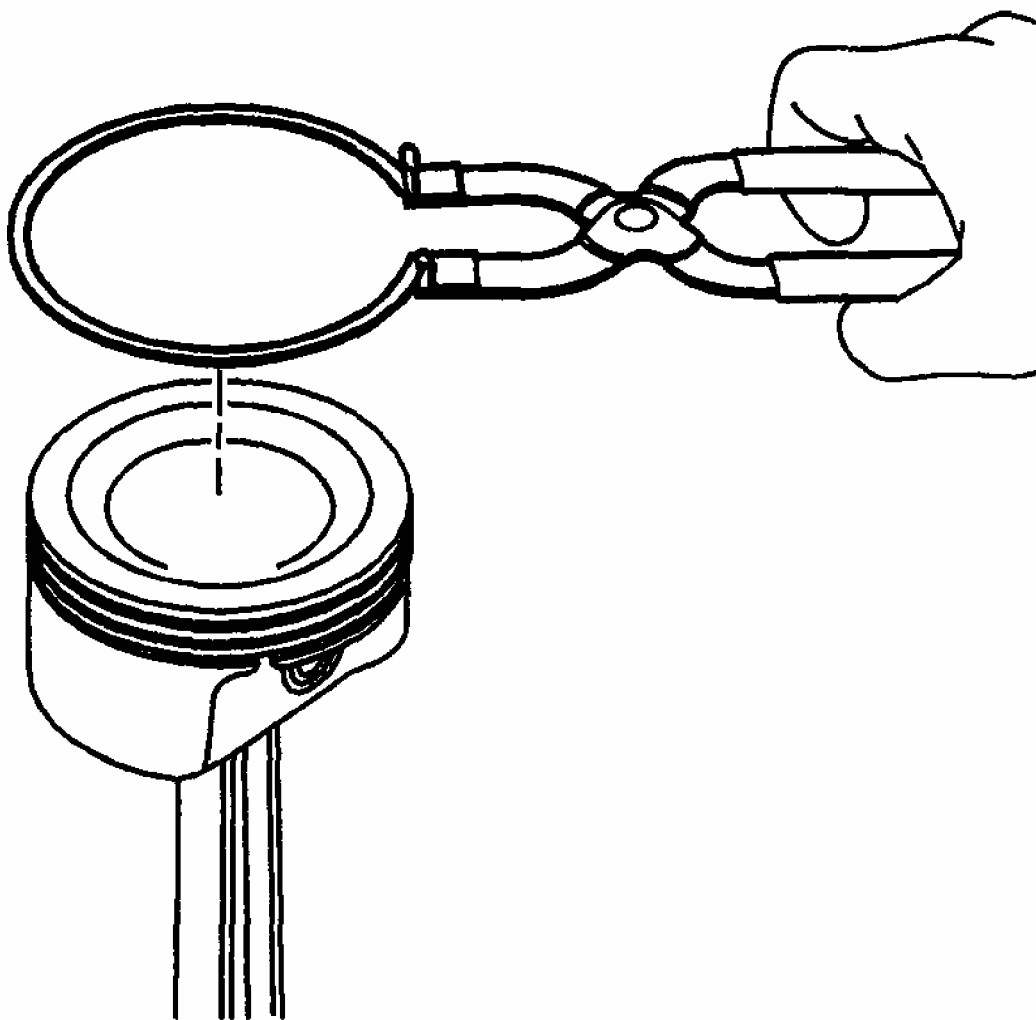
The new piston pin has an interference fit into the connecting rod and is full floating in the piston.

1. Install the new piston pin and connecting rod assembly.
 - 1.1. Lubricate the piston pin bores with clean engine oil.
 - 1.2. Use a torch and apply MILD heat to the piston pin end of the connecting rod.
 - 1.3. Use the **J 24086-C** in order to press the new piston pin into the piston and connecting rod assembly.
 - 1.4. Inspect for the proper installation of the piston and piston pin.

The piston must move freely on the new piston pin with no binding or interference.

NOTE: **Use a piston ring expander to install the piston rings. The rings may be damaged if expanded more than necessary.**

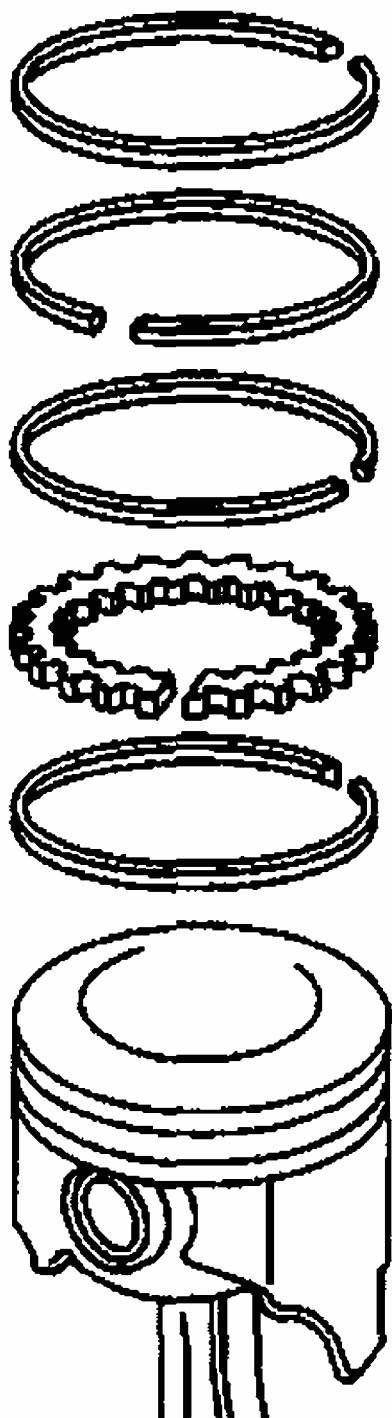
2. Install the piston rings onto the piston.
 - 2.1. Install the oil control piston ring spacer.
 - 2.2. Install the lower oil control piston ring.
 - 2.3. Install the upper oil control piston ring.
 - 2.4. Install the lower compression piston ring. The mark on the side of the piston ring should face the top of the piston.
 - 2.5. Install the upper compression piston ring. The mark on the side of the piston ring should face the top of the piston.



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Fig. 127: Upper Compression Piston Ring
Courtesy of GENERAL MOTORS CORP.

3. Space the compression piston ring end gaps 120 degrees apart.
4. Space the oil control piston ring end gaps a minimum of 90 degrees apart.



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Fig. 128: Piston Rings
Courtesy of GENERAL MOTORS CORP.

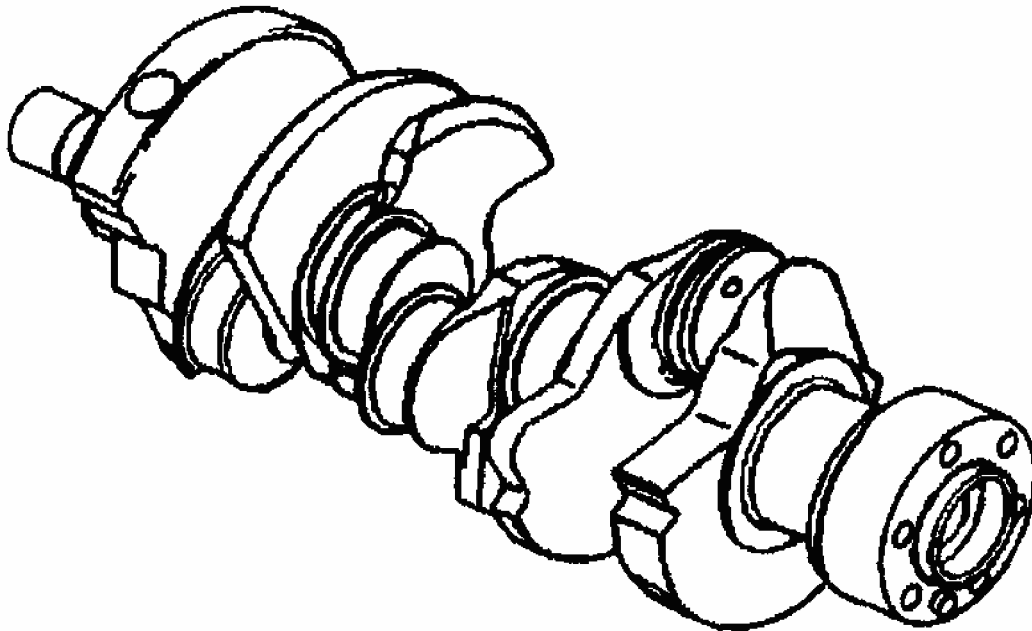
CRANKSHAFT & BEARINGS CLEANING & INSPECTION

Tools Required

- **J 7872** Magnetic Base Dial Indicator
- **J 36660-A** Torque Angle Meter
- **J 43690** Rod Bearing Clearance Checking Tool

Important: Use care when handling the crankshaft. Avoid damage to the crankshaft bearing surfaces.

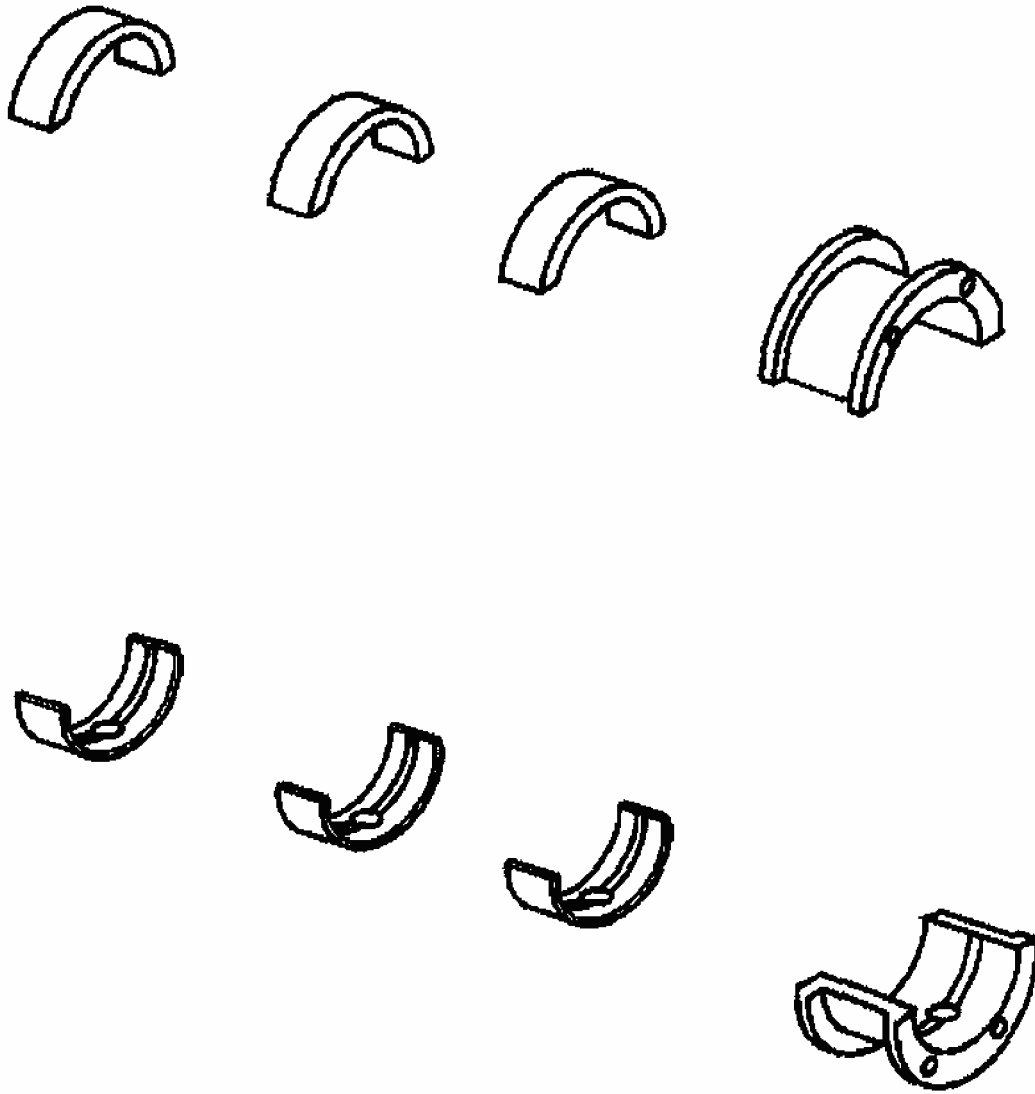
1. Clean the crankshaft in cleaning solvent. Remove all sludge or restrictions from the oil passages.
2. Dry the crankshaft with compressed air.



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Fig. 129: Crankshaft Assembly
Courtesy of GENERAL MOTORS CORP.

3. Clean the crankshaft bearings in cleaning solvent. Wipe the crankshaft bearings clean with a soft cloth, do not scratch the crankshaft bearing surfaces.
4. Dry the crankshaft bearings with compressed air.

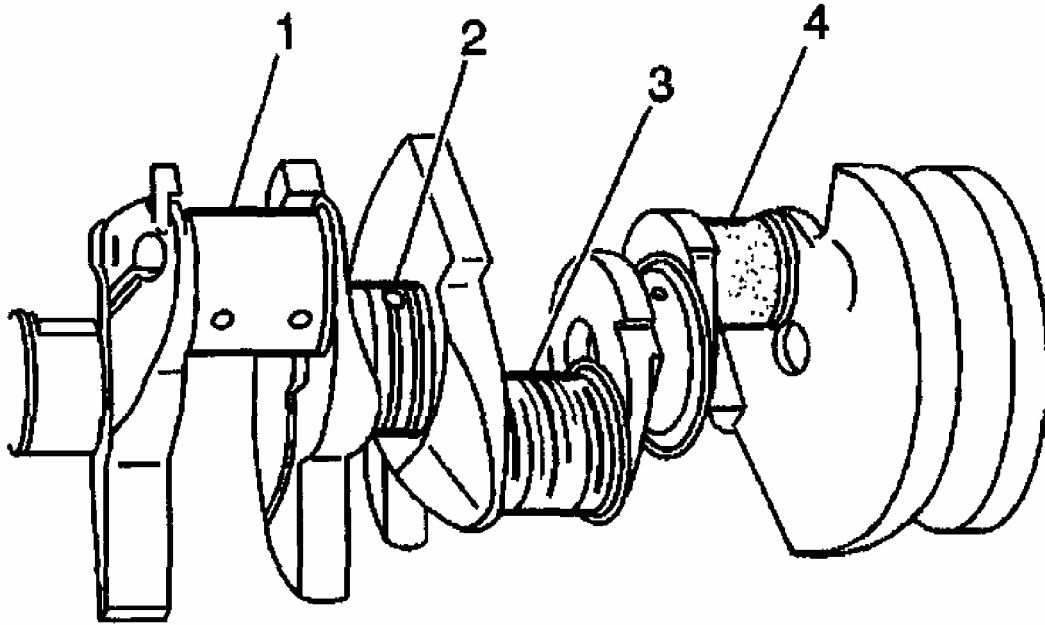


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Fig. 130: Crankshaft Bearings
Courtesy of GENERAL MOTORS CORP.

5. Inspect the crankshaft for the following:
 - Crankshaft journals (1) should be smooth with no evidence of scoring or damage.
 - Deep grooves (2)
 - Scratches or uneven wear (3)
 - Pitted surfaces (4)
 - Wear or damage to the thrust journal surfaces
 - Scoring or damage to the rear seal surface

- Restrictions to the oil passages
- Damage to the threaded bolt holes



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Fig. 131: Inspecting Crankshaft For Wear Or Damage
Courtesy of GENERAL MOTORS CORP.

6. Inspect the crankshaft balancer key (1), the keyway (2), and the threaded hole (3) for damage. Repair or replace the crankshaft as necessary.

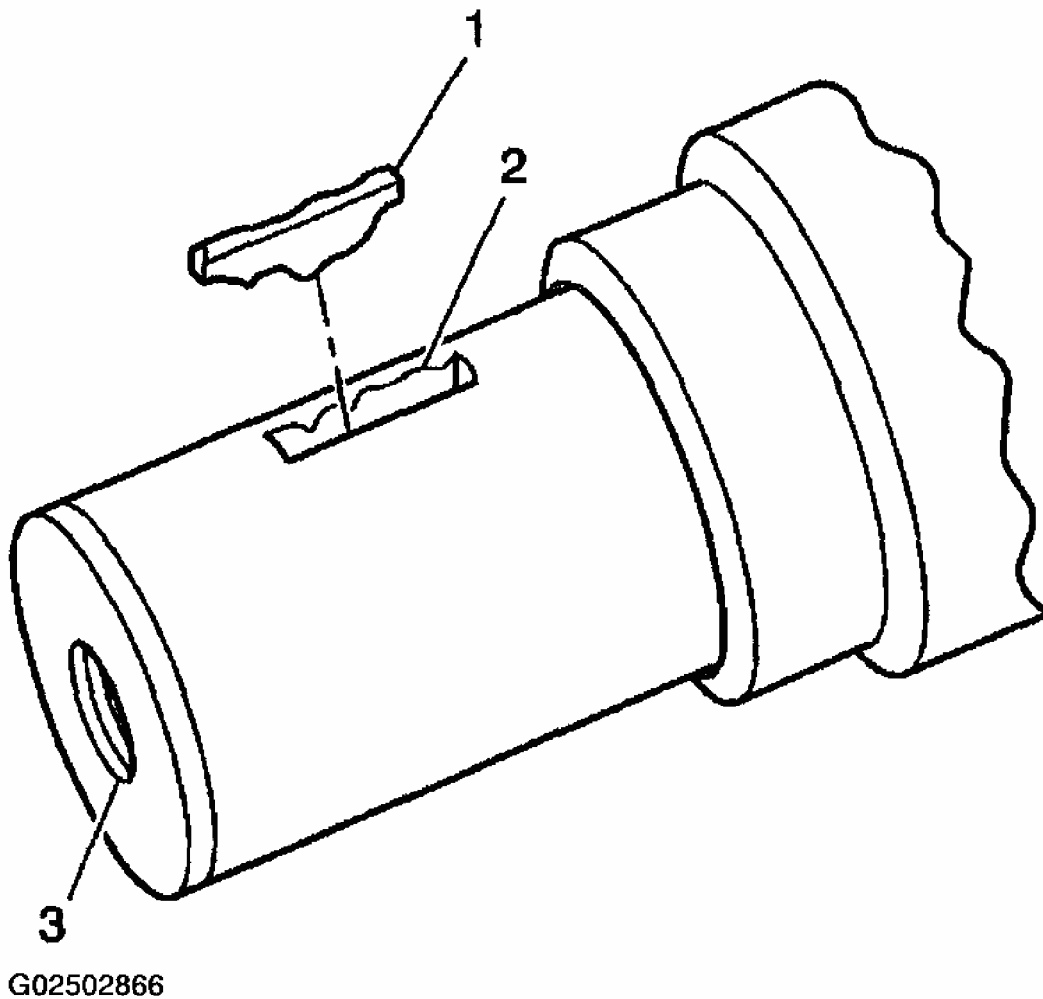
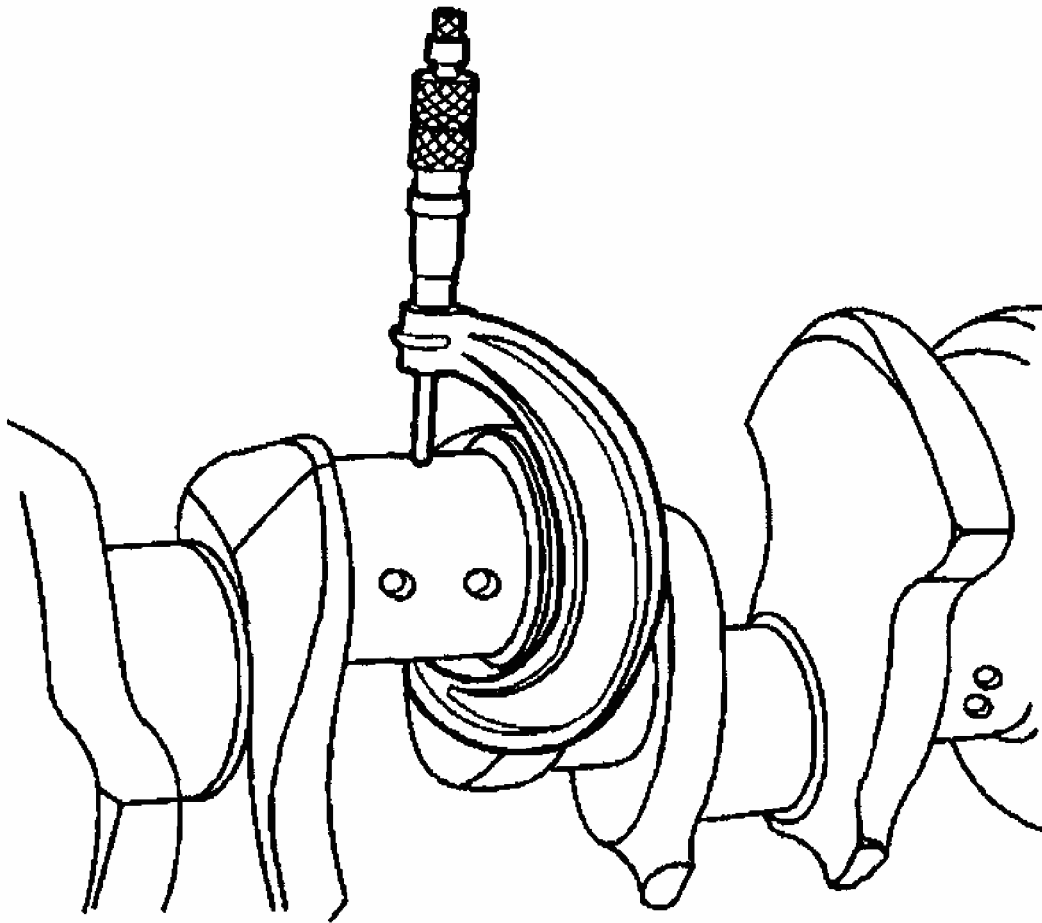


Fig. 132: Crankshaft Balancer Key & Keyway
Courtesy of GENERAL MOTORS CORP.

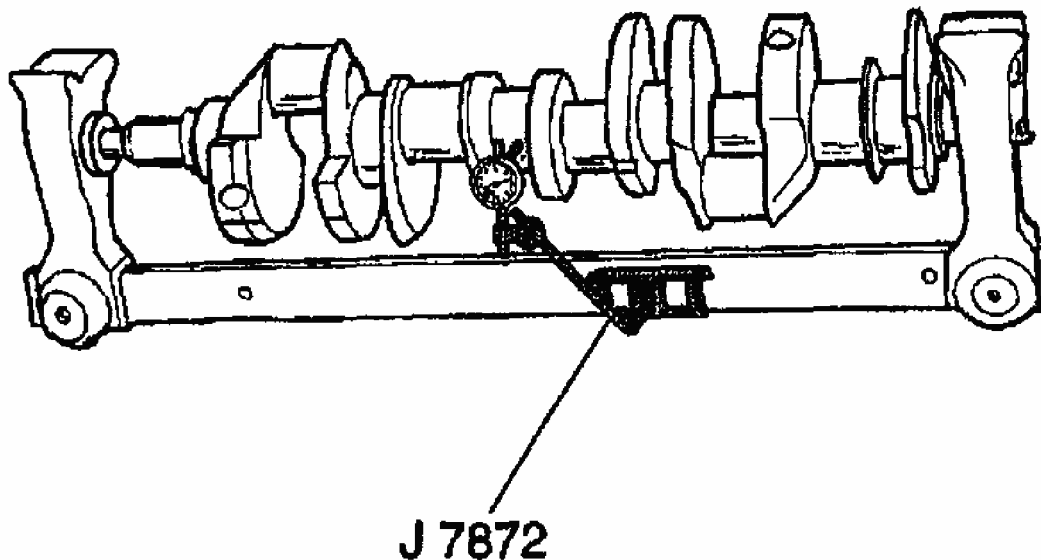
7. Measure the crankpins for out-of-round and taper. Refer to **Engine Mechanical Specifications** .



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Fig. 133: Measuring Crankpins For Out-Of-Round & Taper
Courtesy of GENERAL MOTORS CORP.

8. Use a suitable support to support the crankshaft on the front and rear journals.
9. Use the **J 7872** in order to measure the crankshaft journal runout. The proper crankshaft journal runout is 0.025 mm maximum (0.0010 in maximum).



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Fig. 134: Measuring Crankshaft Journal Runout
Courtesy of GENERAL MOTORS CORP.

10. Measure the crankshaft end play.

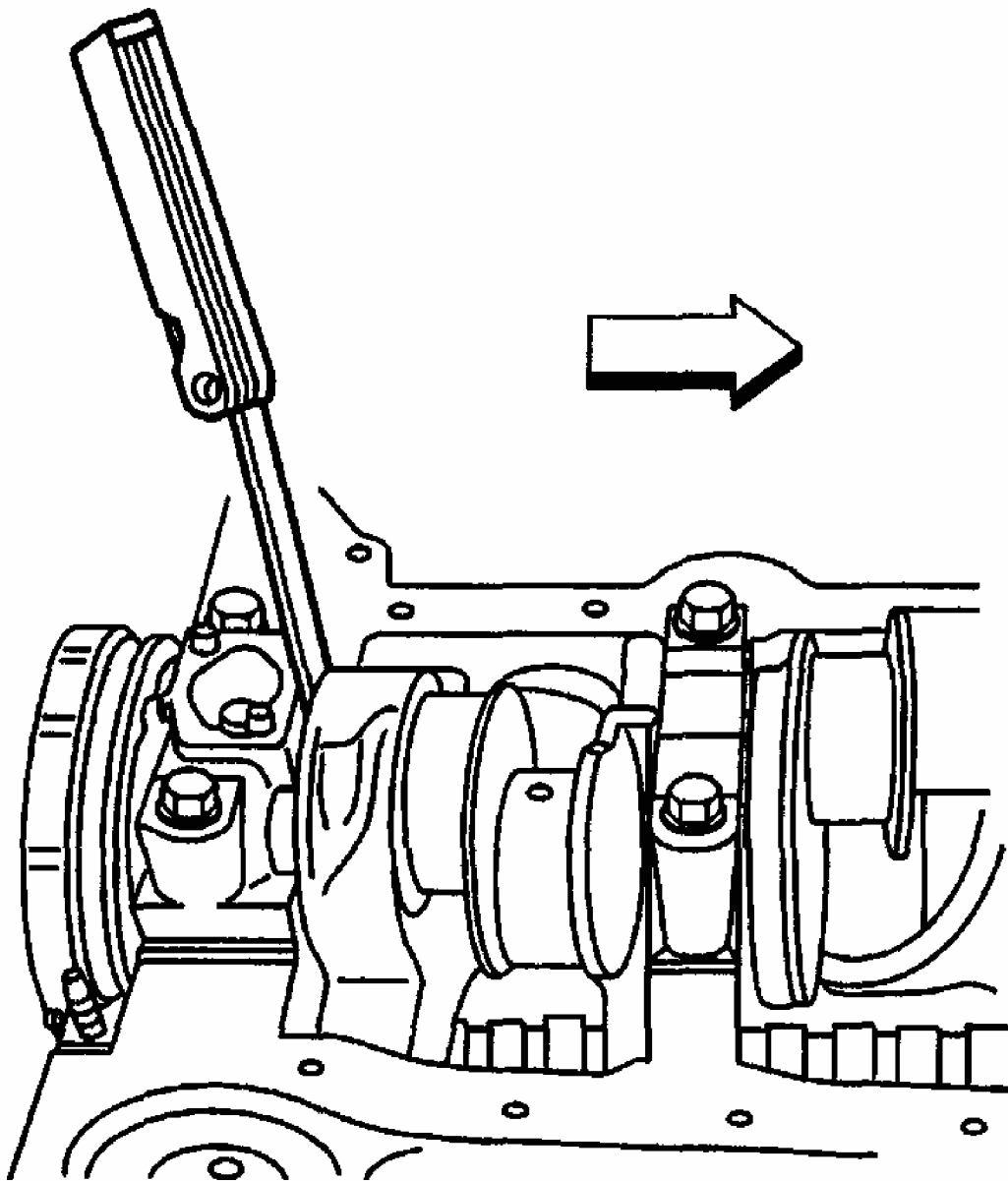
Important: In order to properly measure the crankshaft end play, the crankshaft, the crankshaft bearings, the crankshaft bearing caps, and the crankshaft bearing cap bolts must be installed into the engine block and the bolts tightened. The proper crankshaft bearing cap bolt tightening specification is 105 N.m (77 lb ft).

10.1. Firmly thrust the crankshaft first rearward, then forward. This will align the crankshaft rear bearings and the crankshaft thrust surfaces.

10.2. With the crankshaft pushed forward, insert a feeler gage between the crankshaft and the crankshaft bearing surface and then measure the clearance. The proper crankshaft end play clearance specification is 0.050-0.20 mm (0.002-0.008 in).

10.3. Turn the crankshaft to check for binding. If the crankshaft does not turn freely, then loosen the crankshaft bearing cap bolts, one crankshaft bearing cap at a time, until the tight crankshaft bearing is located.

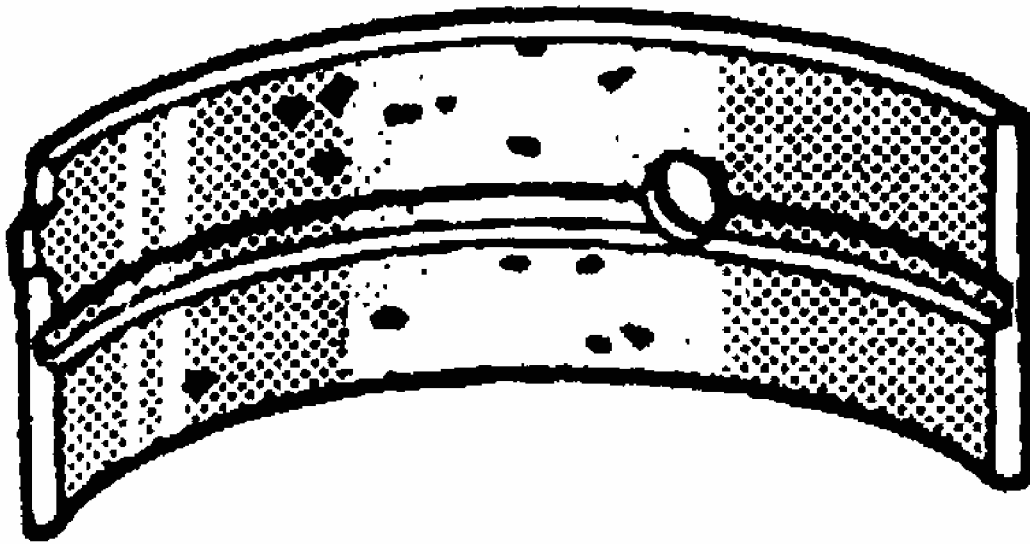
Burrs on the crankshaft bearing cap or engine block, foreign matter between the crankshaft bearing and the crankshaft bearing cap or the engine block, or a faulty crankshaft bearing could cause a lack of clearance between the crankshaft and crankshaft bearing.



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Fig. 135: Checking Clearance Between Crankshaft & Crankshaft Bearing
Courtesy of GENERAL MOTORS CORP.

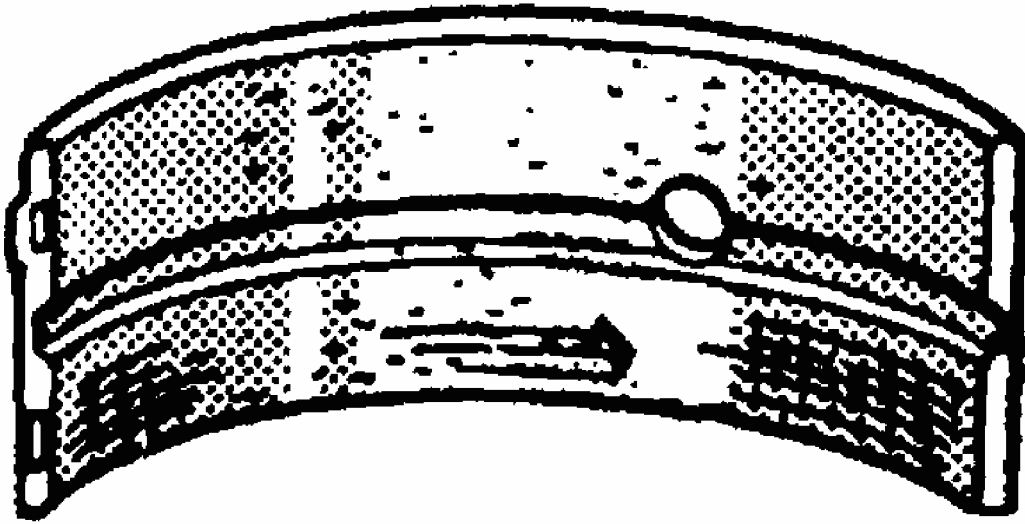
11. Inspect the crankshaft bearings for craters or pockets. Flattened sections on the crankshaft bearing halves also indicate fatigue.



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Fig. 136: Inspecting Crankshaft Bearings For Craters Or Pockets
Courtesy of GENERAL MOTORS CORP.

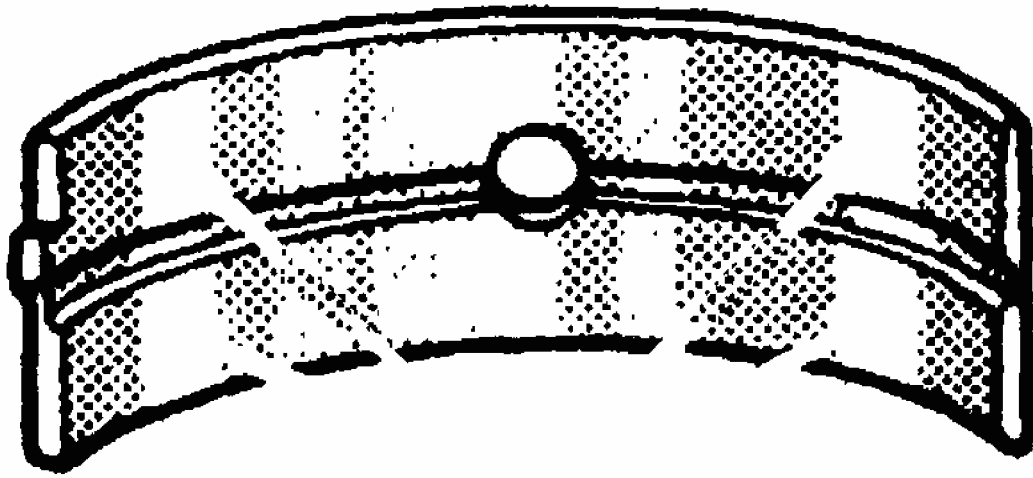
12. Inspect the crankshaft bearings for excessive scoring or discoloration.
13. Inspect the crankshaft bearings for dirt or debris imbedded into the crankshaft bearing material.



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Fig. 137: Dirt Or Debris Imbedded Into Crankshaft Bearing Material
Courtesy of GENERAL MOTORS CORP.

14. Inspect the crankshaft bearings for improper seating indicated by bright, polished sections of the crankshaft bearings.
 - If the lower half of the crankshaft bearing is worn or damaged, both the upper and lower halves of the crankshaft bearing should be replaced.
 - Generally, if the lower half of the crankshaft bearing is suitable for use, the upper half of the crankshaft bearing should also be suitable for use.



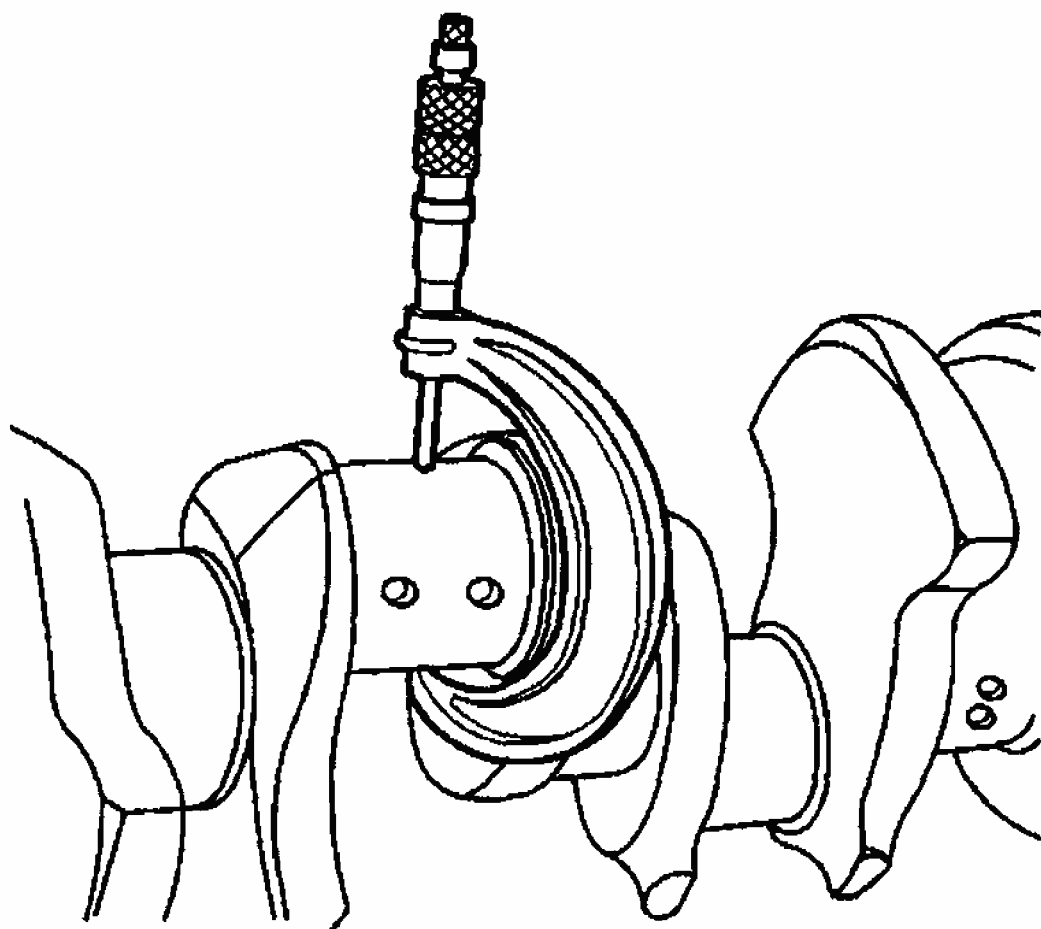
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Fig. 138: Improper Seating Indicated By Bright, Polished Sections Of Crankshaft Bearings

Courtesy of GENERAL MOTORS CORP.

Measuring Crankshaft Bearing Clearances

- The crankshaft bearings are of the precision insert type and do not use shims for adjustment. If the clearances are excessive, then new upper and lower crankshaft bearings will be required. The service crankshaft bearings are available in the standard size and an undersize.
- The selective fitting of the crankshaft bearings are necessary in production in order to obtain close tolerances. For this reason, in one journal bore you may use one-half of a standard crankshaft bearing with one-half of an undersize crankshaft bearing.



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Fig. 139: Measuring Crankshaft Bearing Clearance
Courtesy of GENERAL MOTORS CORP.

- In order to determine the correct replacement bearing size, the bearing clearance must be measured accurately. When checking main bearing clearances, either the micrometer or plastic gage method may be used; however, the micrometer method gives more reliable results and is preferred. When checking connecting rod bearing clearances, the plastic gage method will result in unreliable measurements. The use of **J 43690** is preferred.
- Normally the crankshaft bearing journals wear evenly and are not out-of-round. However, if a crankshaft bearing is being fitted to an out-of-round crankshaft bearing journal, be sure to fit to the maximum diameter of the crankshaft bearing journal. If the crankshaft bearing is fitted to the minimum diameter and the crankshaft bearing journal is excessively out-of-round, the interference between the crankshaft bearing and the crankshaft bearing journal will result in rapid crankshaft bearing failure.
- If the crankshaft bearing clearance is within specifications, the crankshaft bearing is

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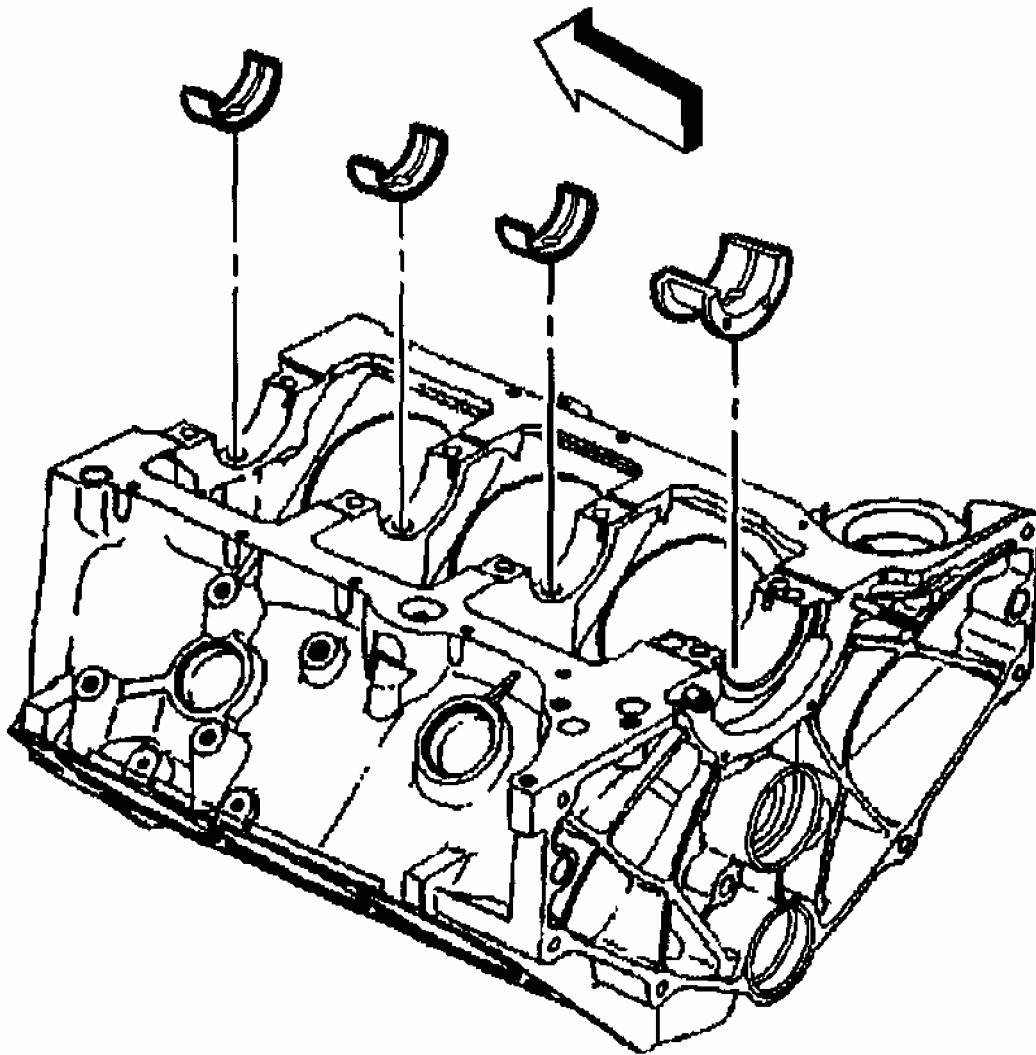
2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

satisfactory. If the clearance is not within specifications, replace the crankshaft bearing. Always replace both the upper and lower crankshaft bearings as a set.

- A standard or undersize crankshaft bearing combination may result in the proper clearance. If the proper crankshaft bearing clearance cannot be achieved using the standard or the undersize crankshaft bearings, it may be necessary to repair or replace the crankshaft.

Measuring Crankshaft Bearing Clearances - Micrometer Method

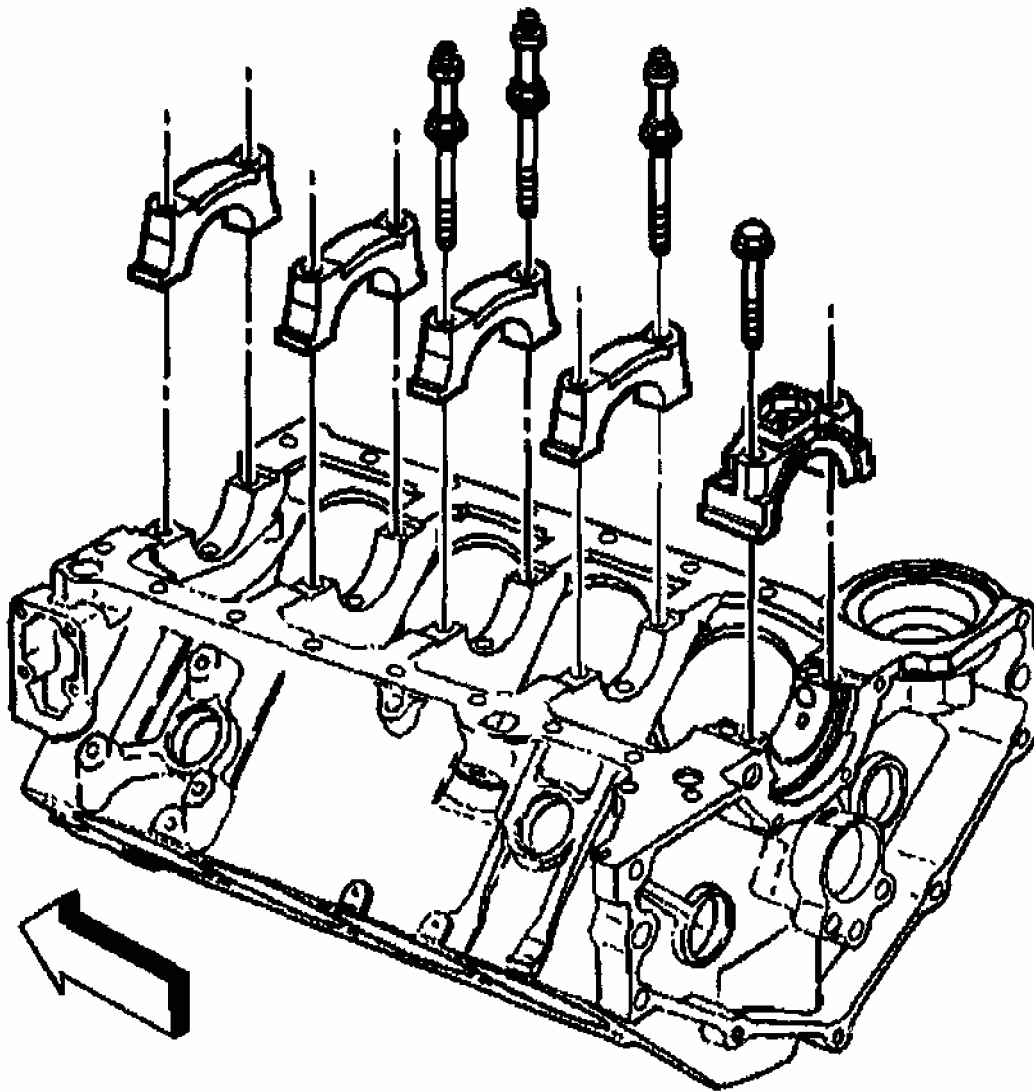
1. Measure the crankshaft journal diameter with a micrometer in several places, approximately 90 degrees apart. Average the measurements.
2. Determine the taper and out-of-round of the journal. Refer to **Engine Mechanical Specifications** .
3. Install the bearings into the engine block or connecting rod assembly.



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Fig. 140: Installing Bearings Into Engine Block
Courtesy of GENERAL MOTORS CORP.

4. Install the bearing cap bolts and tighten to specifications. Refer to **Fastener Tightening Specifications** .



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Fig. 141: Installing Bearing Cap Bolts
Courtesy of GENERAL MOTORS CORP.

5. Measure the bearing inside diameter (ID) at two points 90 degrees apart. Average the measurements.
6. In order to determine the bearing clearance, subtract the average journal diameter from the average bearing inside diameter.
7. Compare the readings to specifications. Refer to **Engine Mechanical Specifications** .
8. Replace bearing halves as required to obtain the proper bearing clearances.

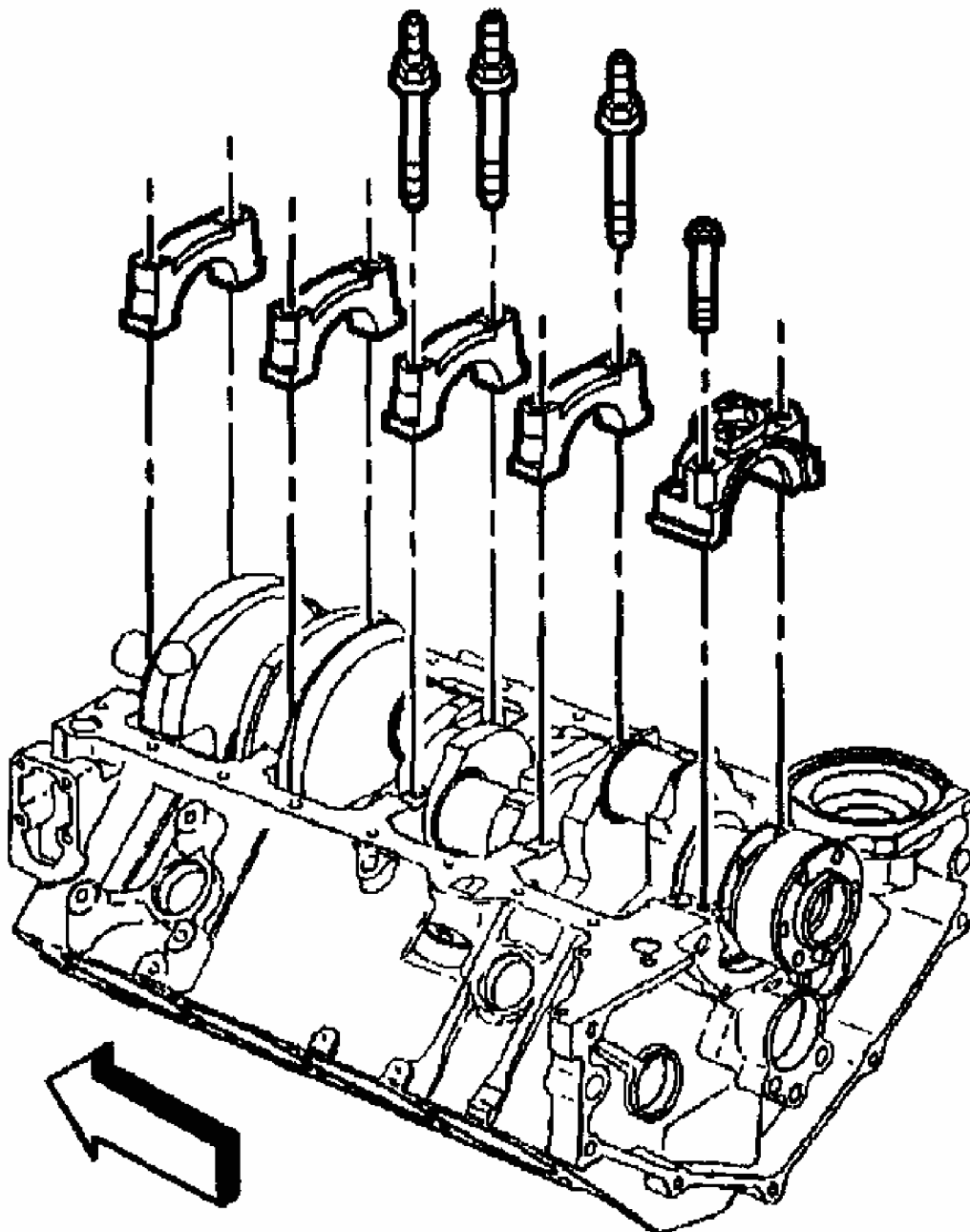
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1. Remove the oil pan and other necessary components to gain access to the connecting rods. Remove the oil pump, screen, and deflector, when applicable.
2. Rotate the crankshaft until the crankshaft journal/connecting rod to be measured is in the 10 o'clock position.

Important: The crankshaft must be secure with no movement or rotation in order to obtain an accurate reading. Remove an intermediate bearing cap, as required, in order to secure the crankshaft and allow measurement of connecting rod bearing clearances.

3. Remove the bearing cap bolts, cap and bearing half.

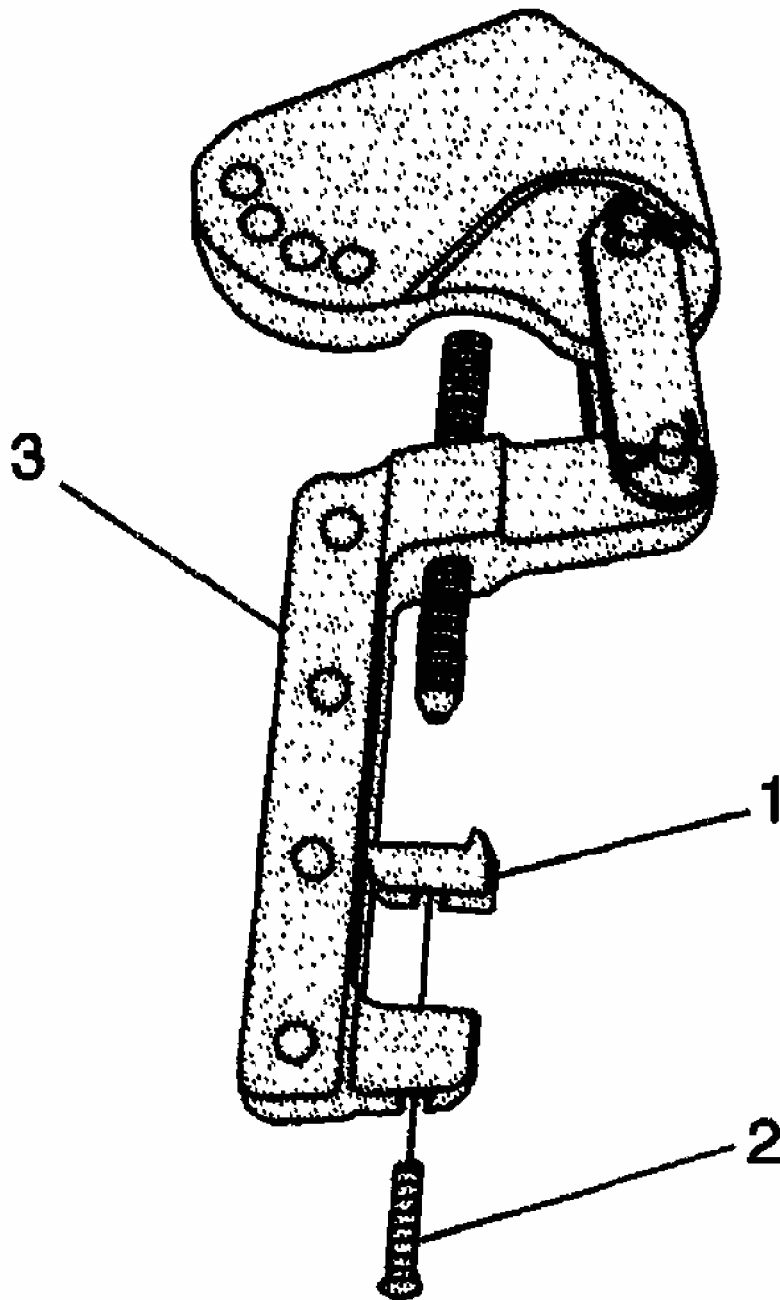


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Fig. 142: Bearing Cap Bolts, Cap & Bearing Half
Courtesy of GENERAL MOTORS CORP.

4. Insert a piece of paper card stock onto the crankshaft journal. Install the bearing half, bearing cap, and bolts. Refer to **Fastener Tightening Specifications** .
5. Install the foot (1) and bolt (2) to the pivot arm assembly (3). Tighten the bolt until

snug.

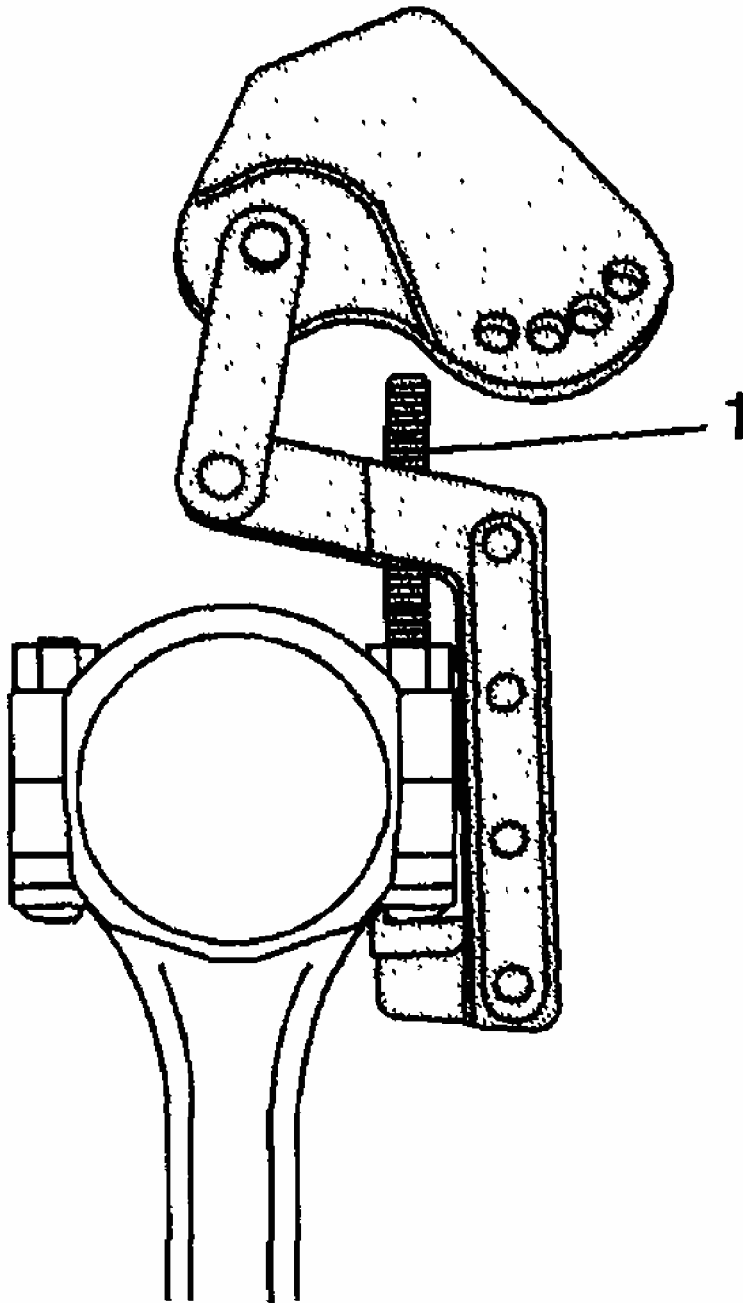


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Fig. 143: Rod Bearing Clearance Checking Tool
Courtesy of GENERAL MOTORS CORP.

6. Install the screw (1 or 3) to the pivot arm assembly (2).
7. Install the pivot arm assembly (1) onto the connecting rod.

8. Position the foot of the pivot arm assembly over the large end of the connecting rod bolt.
9. Position the screw (1) onto the small end of the connecting rod bolt and tighten securely.

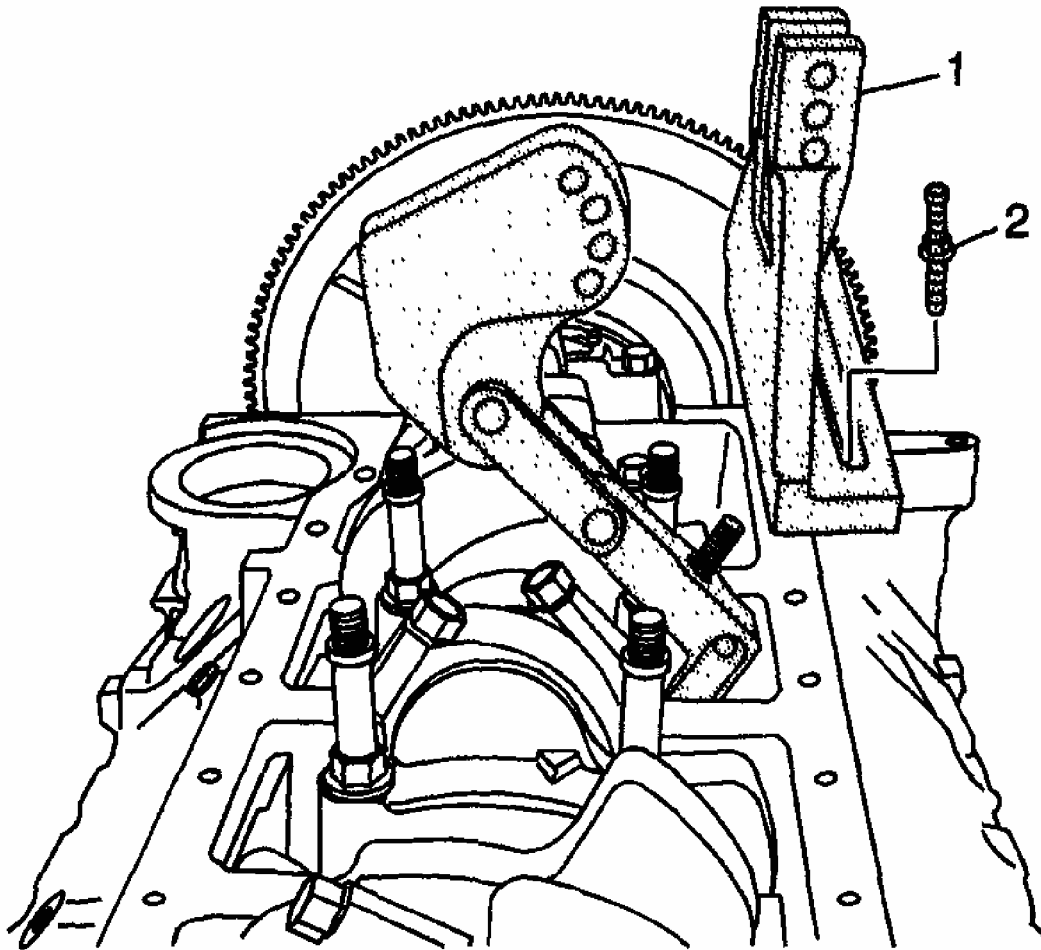


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Fig. 144: Positioning Screw Onto Small End Of Connecting Rod Bolt

Courtesy of GENERAL MOTORS CORP.

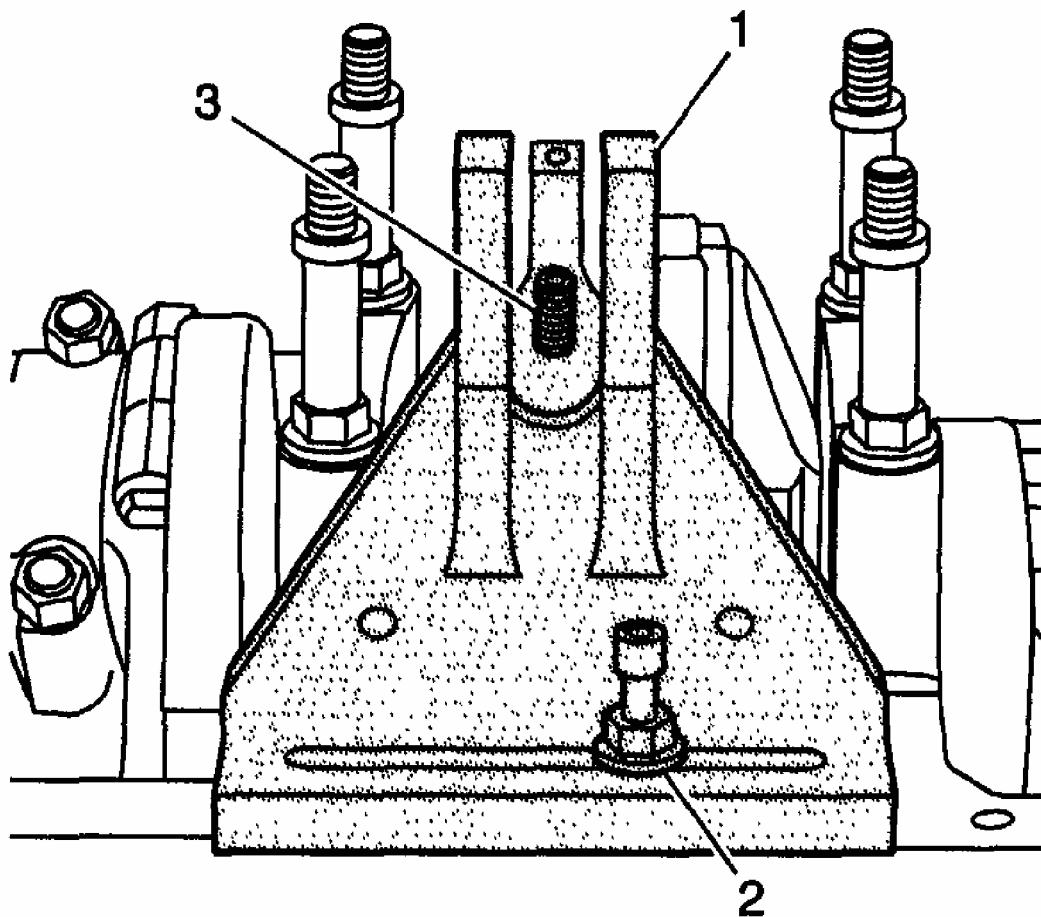
10. Install the base (1) and bolt (2) to the oil pan rail.



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Fig. 145: Installing Base & Bolt To Oil Pan Rail
Courtesy of GENERAL MOTORS CORP.

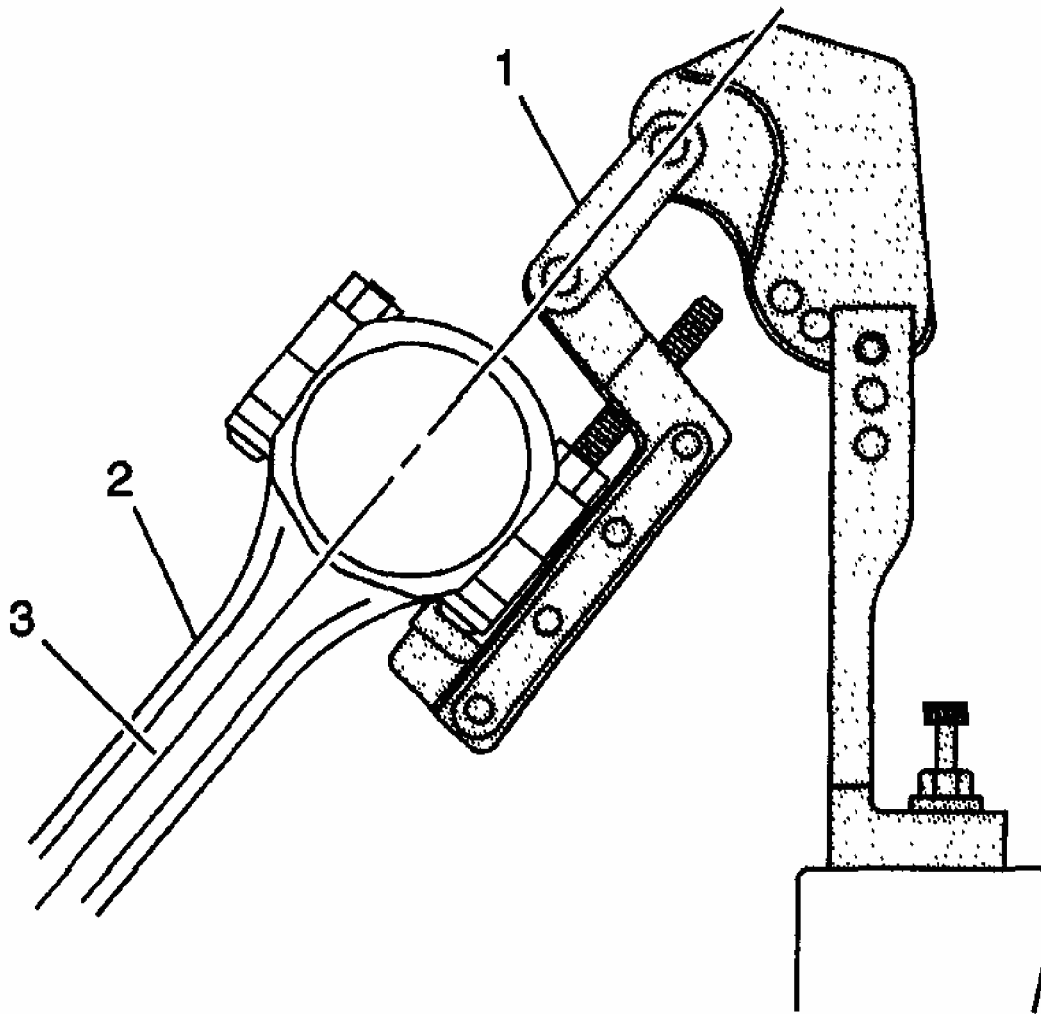
11. Align the center of the base (1) with the screw (3) of the pivot arm assembly. Tighten the bolt (2) until snug.



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Fig. 146: Aligning Center Of Base With Screw Of Pivot Arm Assembly
Courtesy of GENERAL MOTORS CORP.

12. Align the link (1) of the pivot arm assembly on a plane (3) equal to that of the connecting rod beam (2).

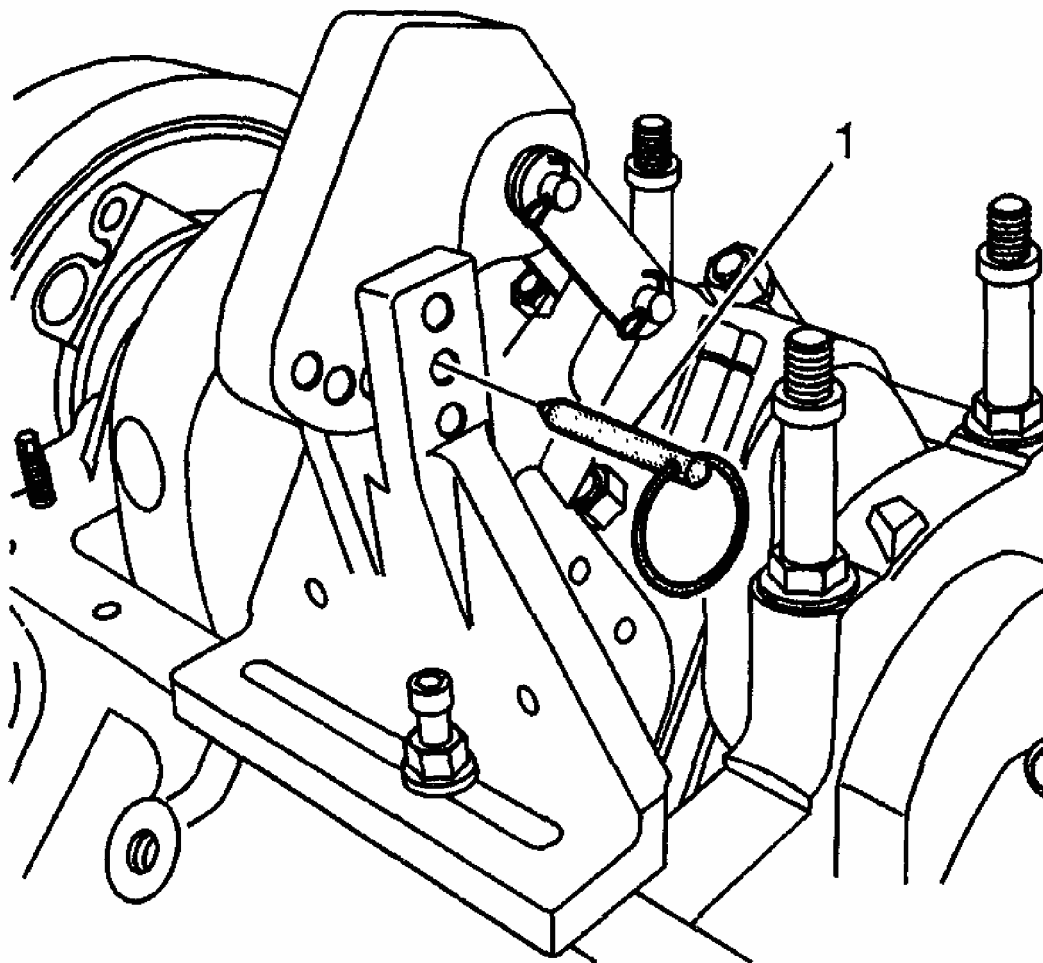


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Fig. 147: Aligning Link Of Pivot Arm Assembly On A Plane Equal To That Of The Connecting Rod Beam

Courtesy of GENERAL MOTORS CORP.

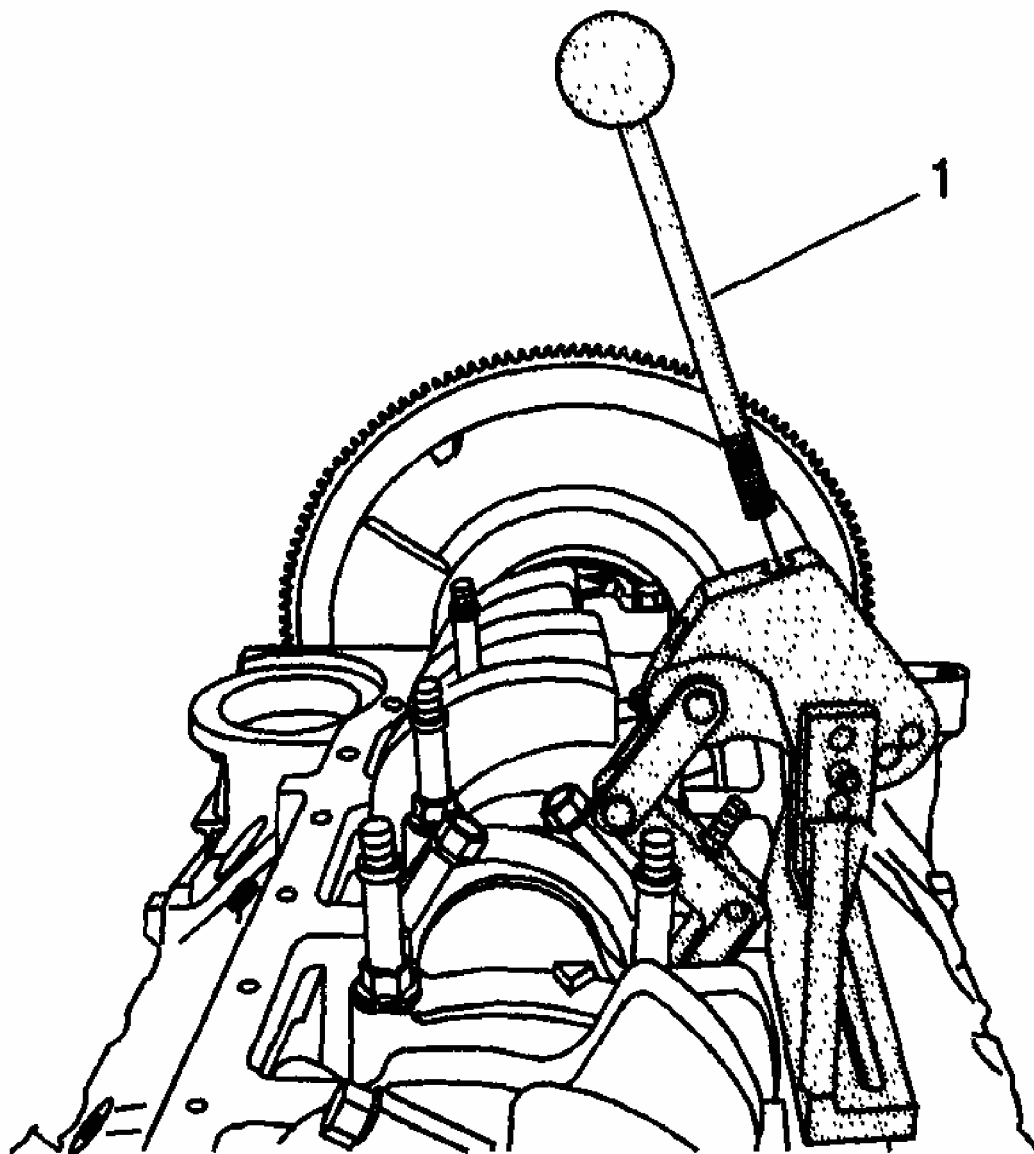
13. With the link of the pivot arm assembly aligned to the beam of the connecting rod, position the pivot arm to the base and insert the pin (1).



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Fig. 148: Positioning Pivot Arm To Base & Insert Pin
Courtesy of GENERAL MOTORS CORP.

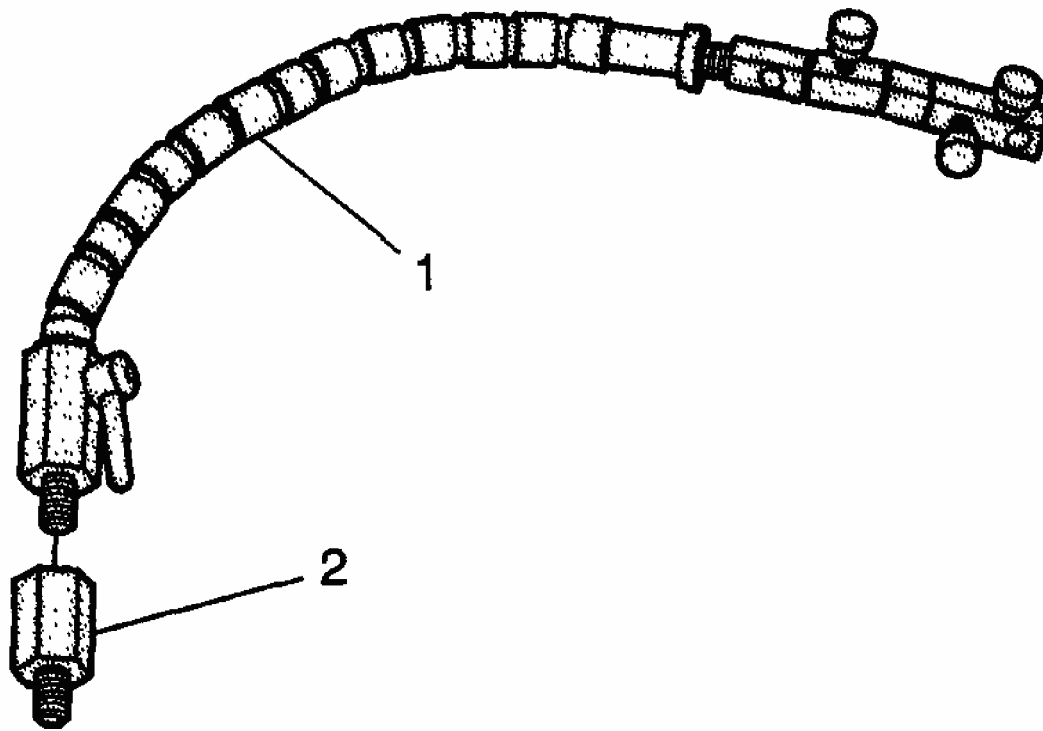
14. Insert the handle (1) to the pivot arm assembly.



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Fig. 149: Inserting Handle To Pivot Arm Assembly
Courtesy of GENERAL MOTORS CORP.

15. Select the adapter (2), as required, and install to the swivel base (1). Tighten until snug.

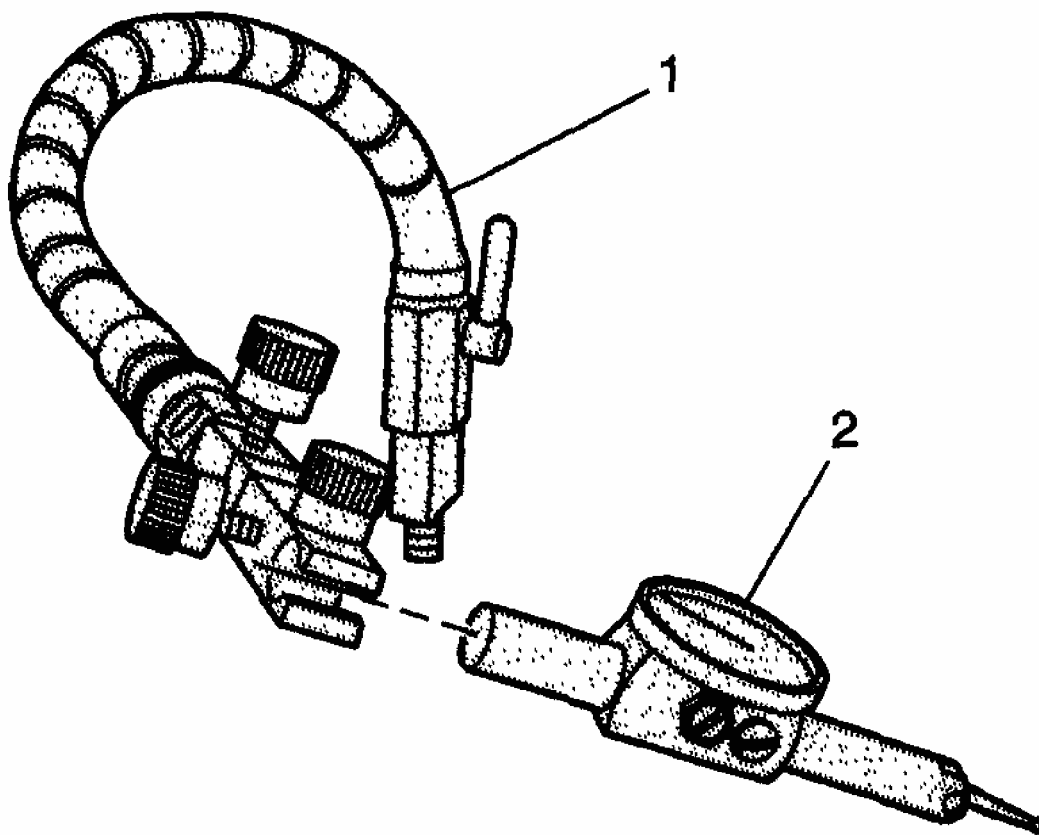


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Fig. 150: Selecting Adapter As Required & Install To Swivel Base
Courtesy of GENERAL MOTORS CORP.

Important: The clamp of the swivel base and the shaft of the indicator should be free of oil or other debris. A loose or improperly clamped indicator may indicate incorrect readings.

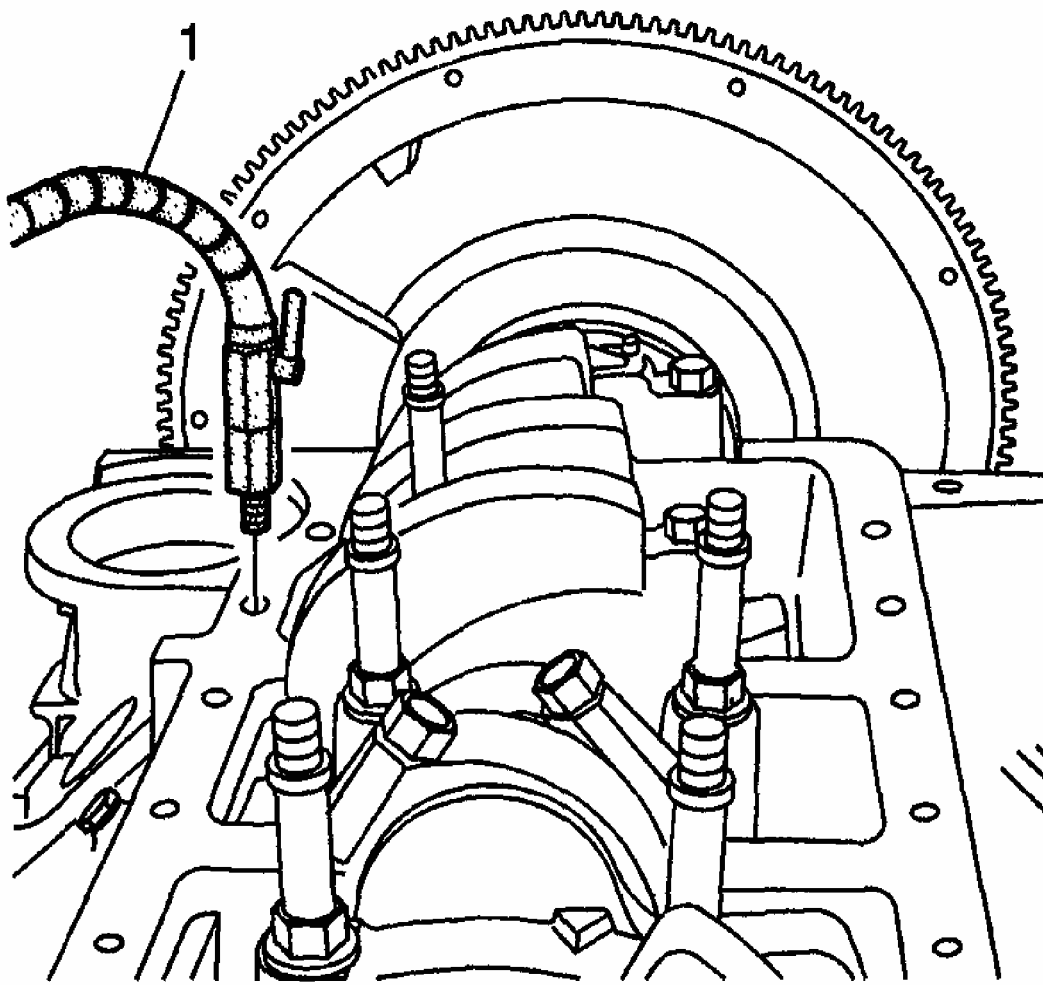
16. Install the indicator (2) to the swivel base (1). Tighten the clamp of the base until snug.



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Fig. 151: Installing Indicator To Swivel Base
Courtesy of GENERAL MOTORS CORP.

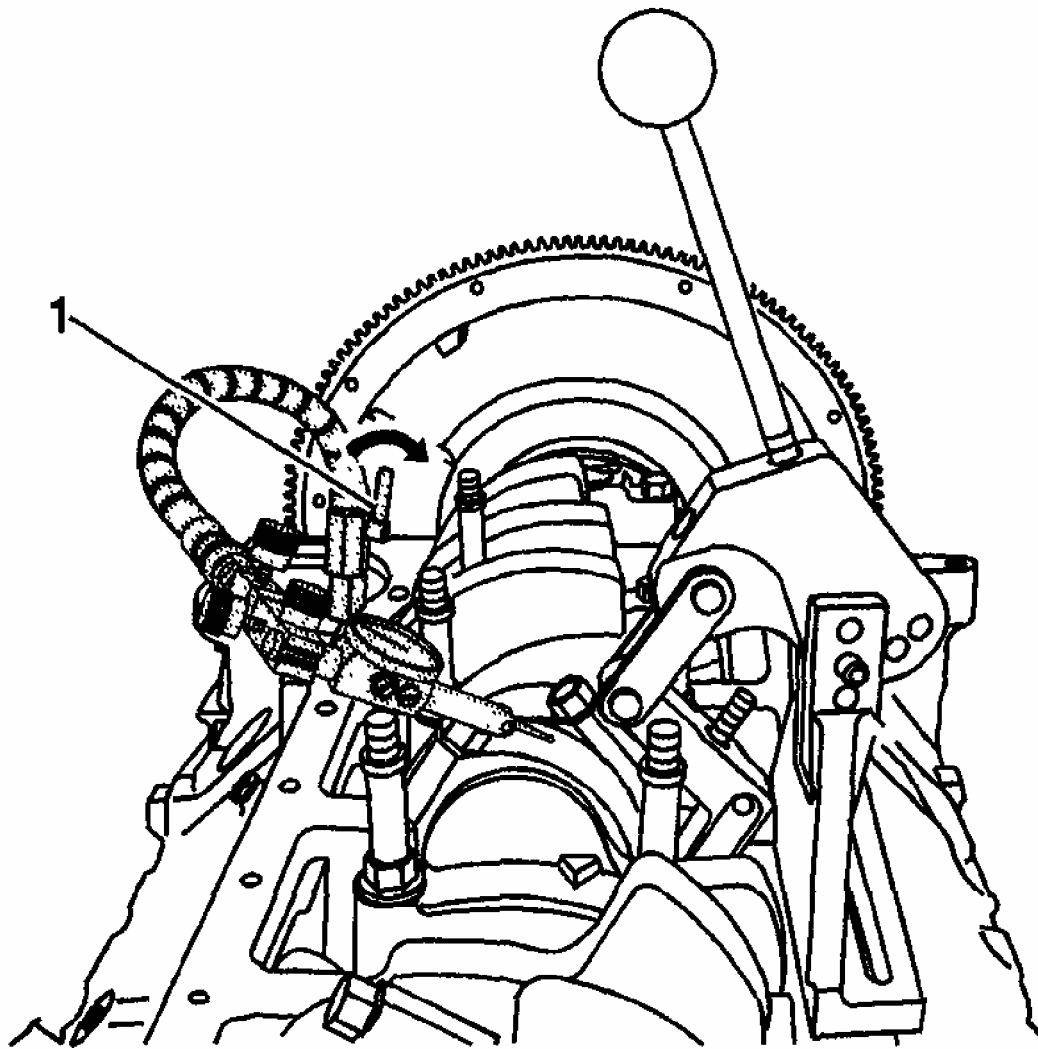
17. Install the swivel base (1) to the oil pan rail of the engine block. Tighten until snug.



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Fig. 152: Installing Swivel Base To Oil Pan Rail Of Engine Block
Courtesy of GENERAL MOTORS CORP.

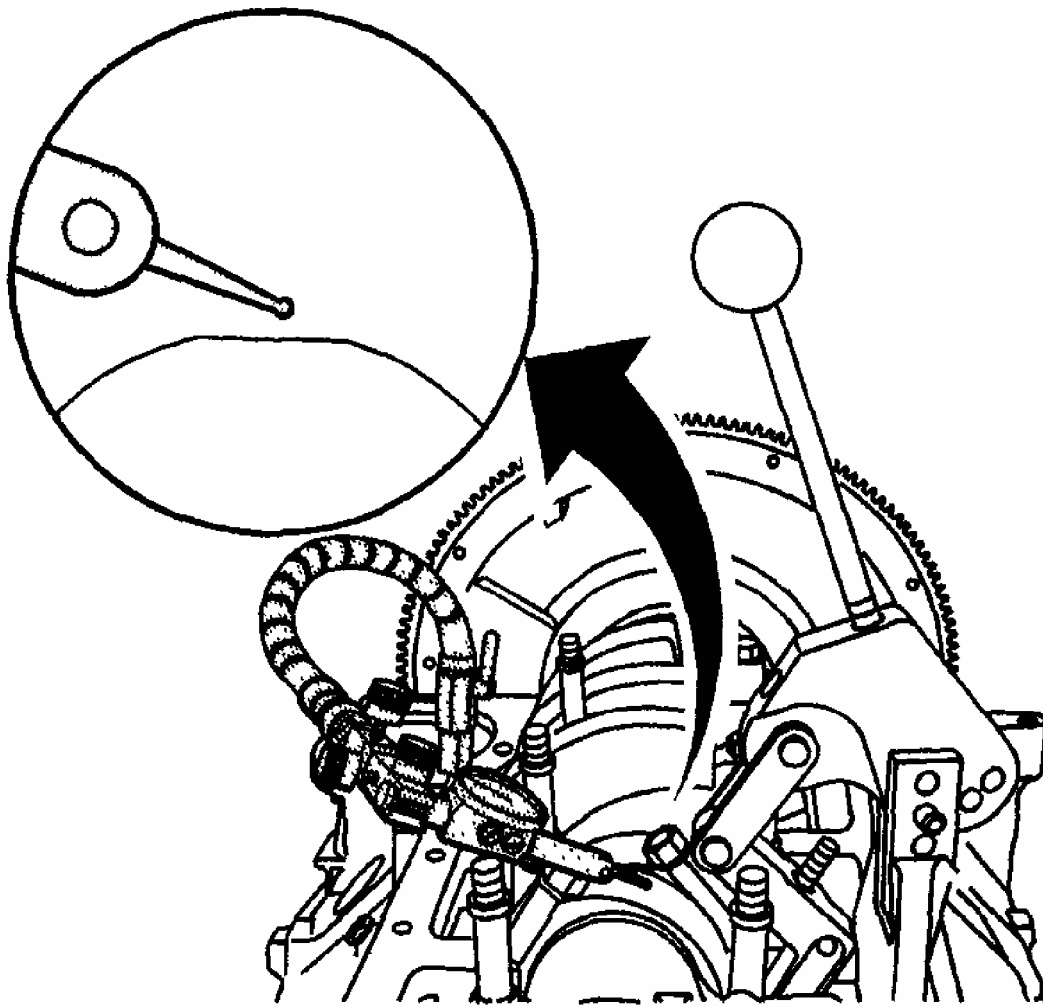
18. Adjust the swivel base as required and position the indicator tip slightly above the connecting rod cap. Lock the swivel base in position by rotating the locking lever (1). Do not allow the tip of the indicator to contact the connecting rod at this time.



G02502889

Fig. 153: Locking The Swivel Base In Position By Rotating Locking Lever
Courtesy of GENERAL MOTORS CORP.

19. The tip of the indicator should be positioned above and NOT in contact with the cap end of the connecting rod.

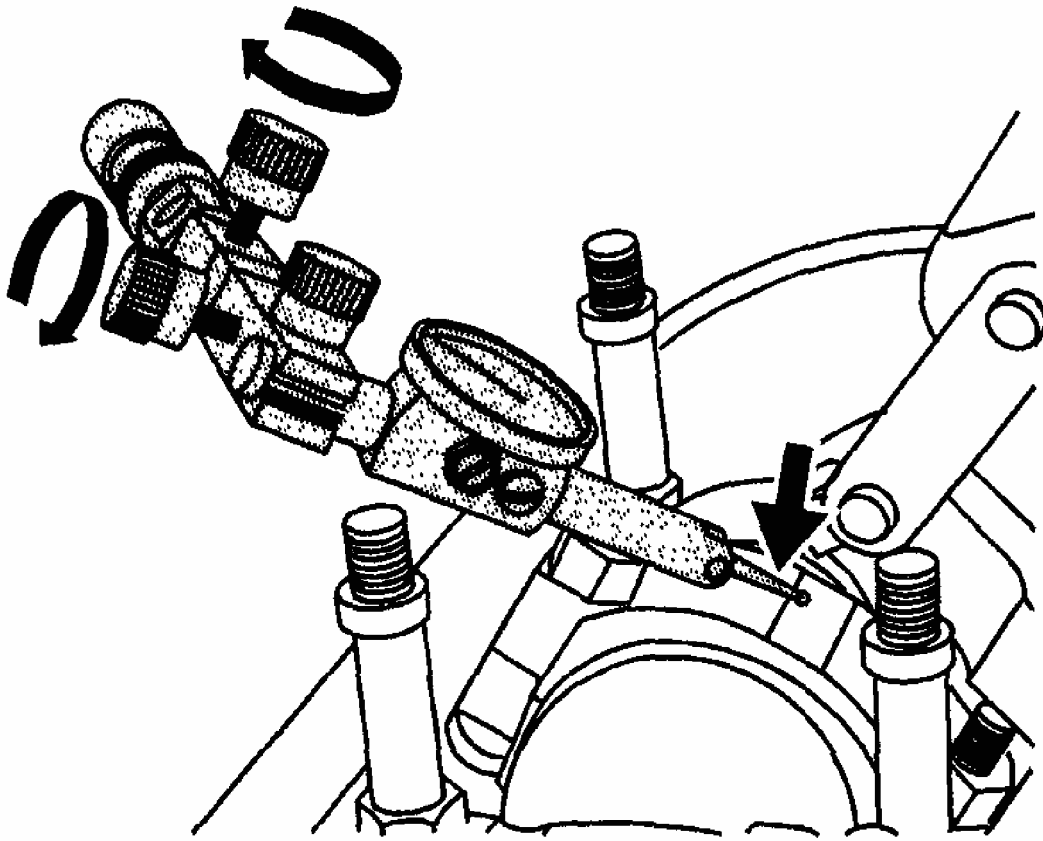


G02502890

Fig. 154: Positioning Tip Of The Indicator Above & Not In Contact With Cap End Of Connecting Rod

Courtesy of GENERAL MOTORS CORP.

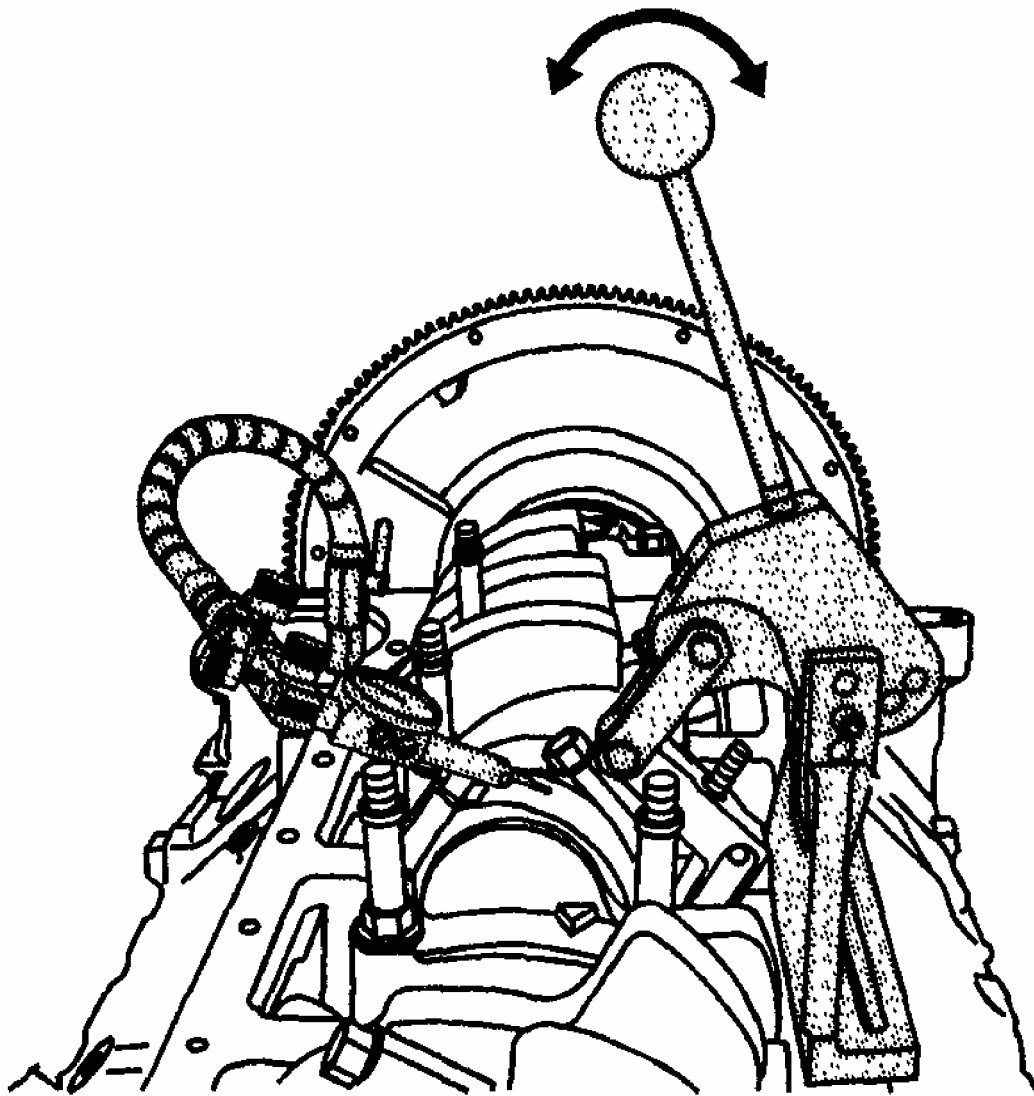
20. Rotate the fine adjustment knobs on the dial indicator end of the swivel base to position the tip of the indicator in contact with the connecting rod.



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Fig. 155: Rotating Fine Adjustment Knobs On Dial Indicator
Courtesy of GENERAL MOTORS CORP.

21. Lightly actuate the handle of the pivot arm assembly, multiple times in both directions, to ensure the oil film is removed from the journal.

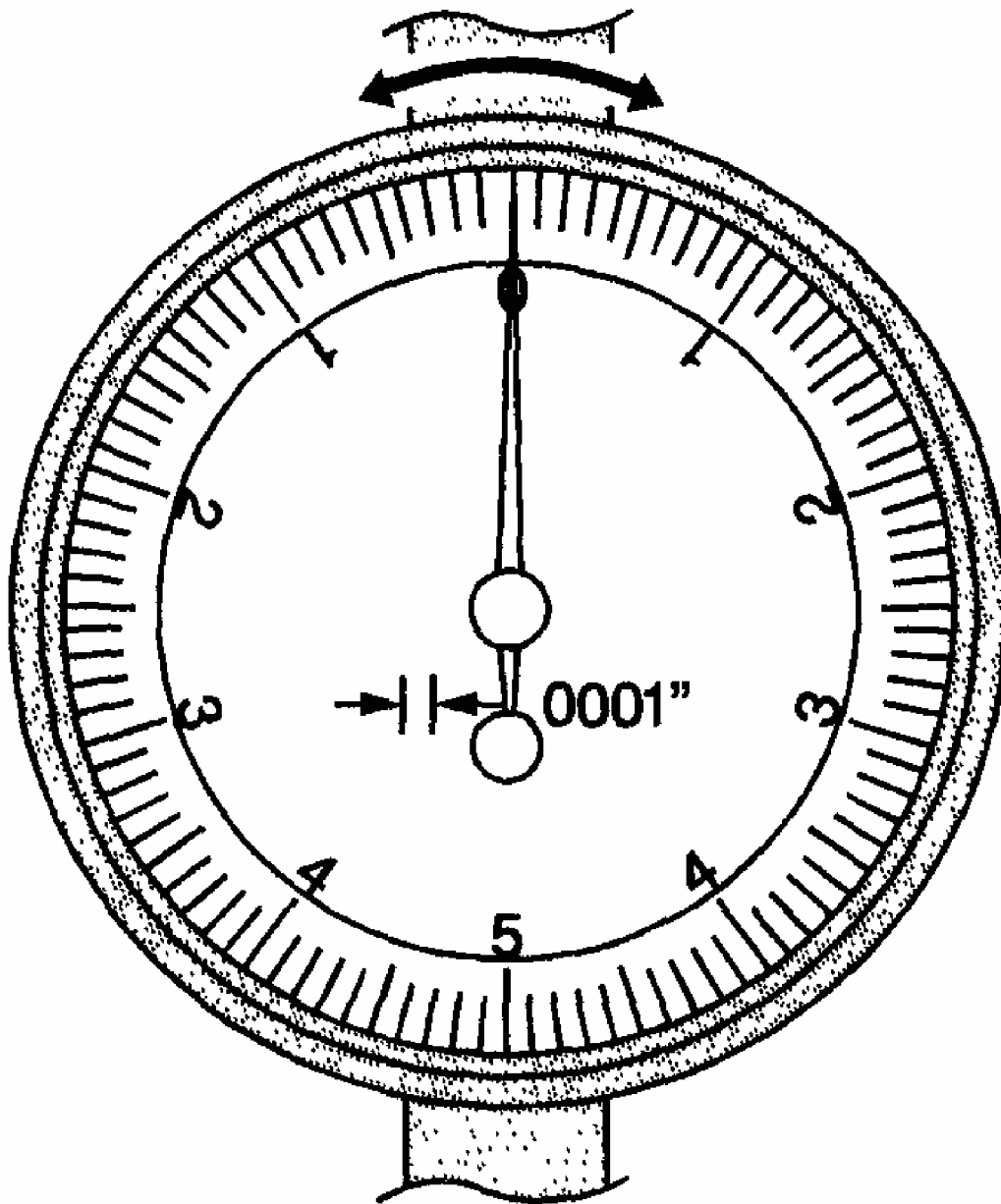


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Fig. 156: Lightly Actuating Handle Of Pivot Arm Assembly
Courtesy of GENERAL MOTORS CORP.

22. Load the handle in the forward position and zero the dial indicator. Load the handle multiple times in both directions and record the reading.

Important: During this procedure, card stock may enter the crankshaft journal oil galleries. Be sure to remove all card stock from the bearing journal and oil galleries prior to reassembly.



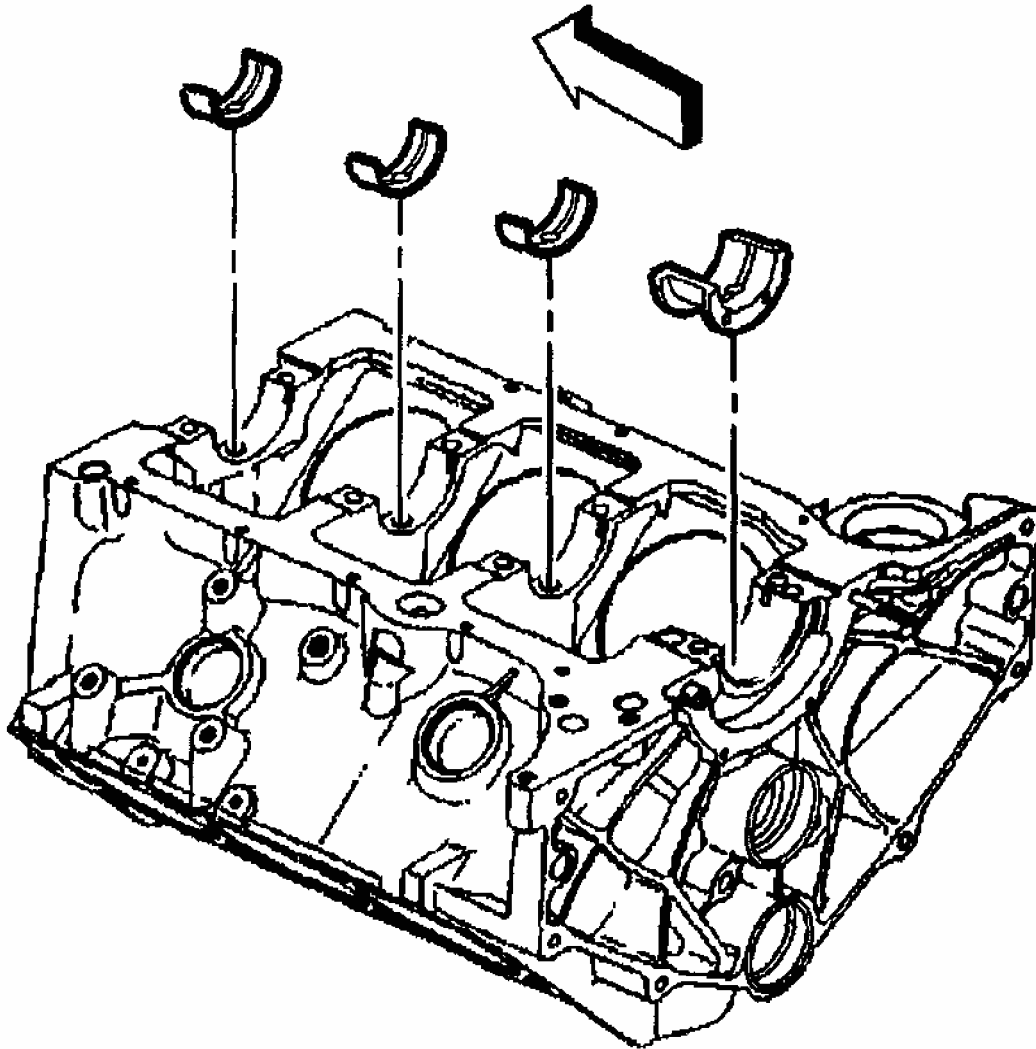
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Fig. 157: Zeroing Dial Indicator
Courtesy of GENERAL MOTORS CORP.

23. Remove the bearing cap bolts, cap, and paper stock.
24. Replace bearing halves as required to obtain the proper bearing clearances.
25. Install the bearings, cap, and bolts. Refer to **Fastener Tightening Specifications** .

Measuring Crankshaft Bearing Clearances - Plastic Gage Method

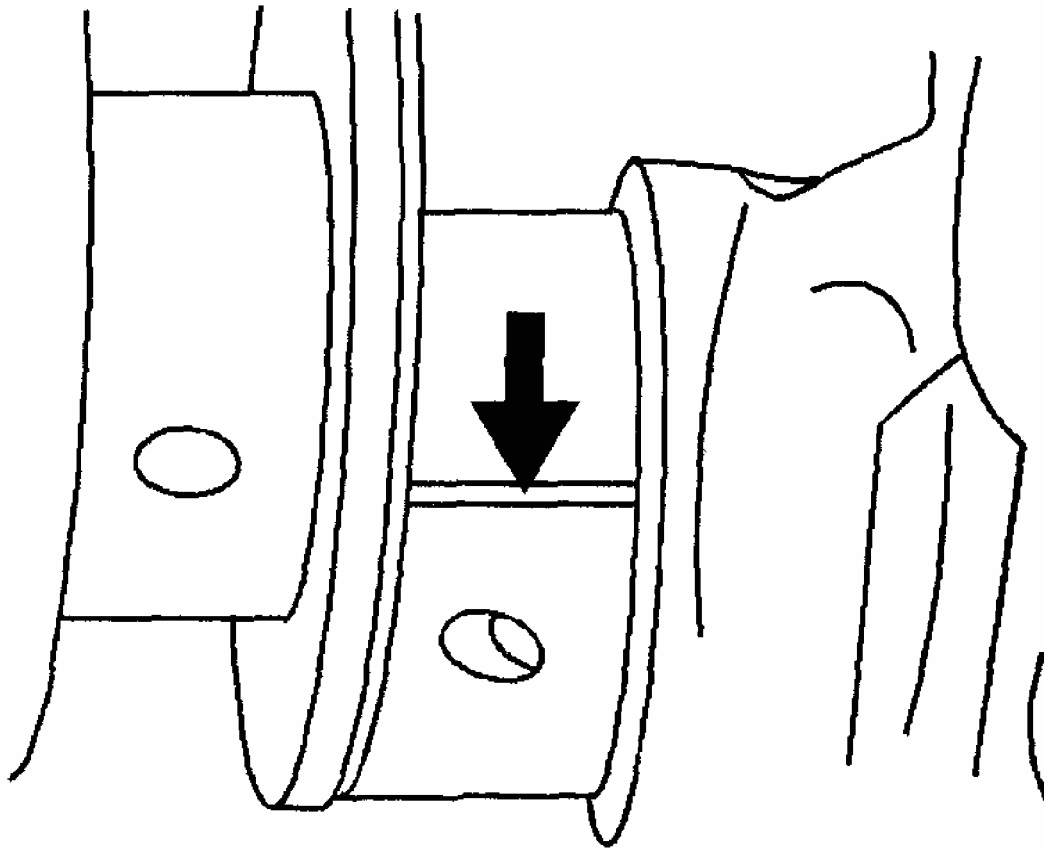
1. Install the crankshaft bearings into the engine block.



G02502894

Fig. 158: Installing Crankshaft Bearings Into Engine Block
Courtesy of GENERAL MOTORS CORP.

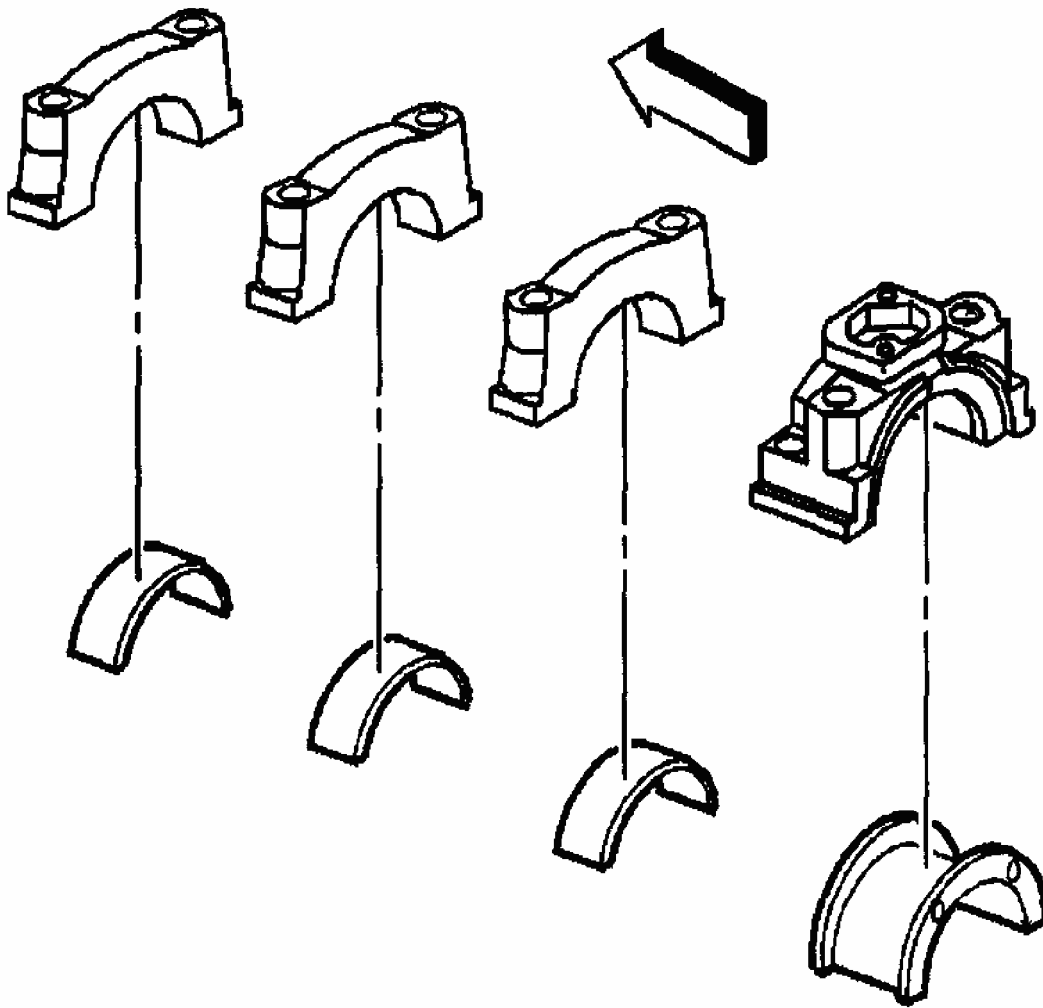
2. Install the crankshaft.
3. Install the gaging plastic the full width of the journal.



G02502896

Fig. 159: Installing Gaging Plastic
Courtesy of GENERAL MOTORS CORP.

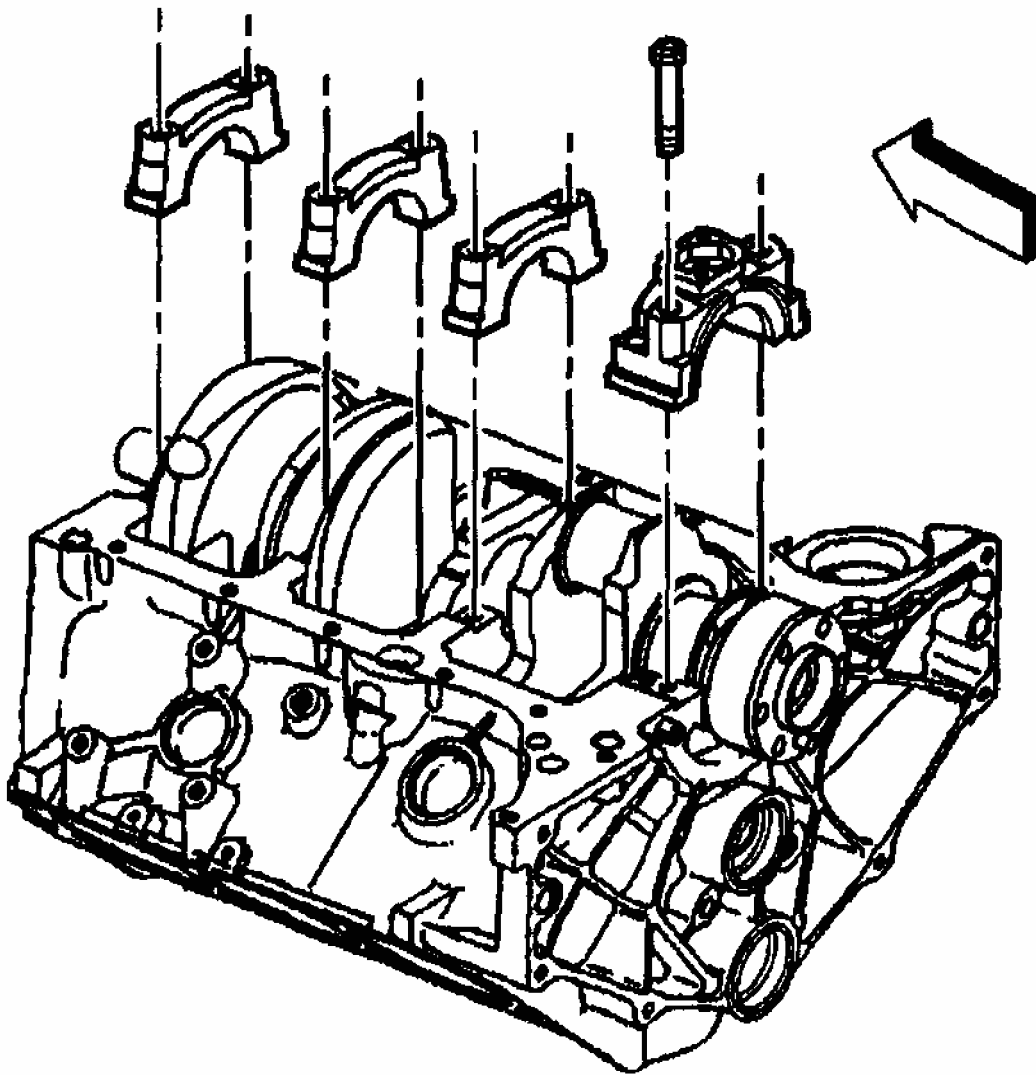
4. Install the crankshaft bearings into the crankshaft bearing caps.



G02502897

Fig. 160: Installing Crankshaft Bearings Into Crankshaft Bearing Caps
Courtesy of GENERAL MOTORS CORP.

5. Install the crankshaft bearing caps in the original positions and with the arrow on the crankshaft bearing caps in the direction of the front of the engine block.
6. Install the crankshaft bearing cap bolts. Tighten the crankshaft bearing caps to 105 N.m (77 lb ft).
7. Remove the crankshaft bearing cap bolts.
8. Remove the crankshaft bearing caps. The gaging plastic may adhere to either the crankshaft bearing journal or the crankshaft bearing surface.



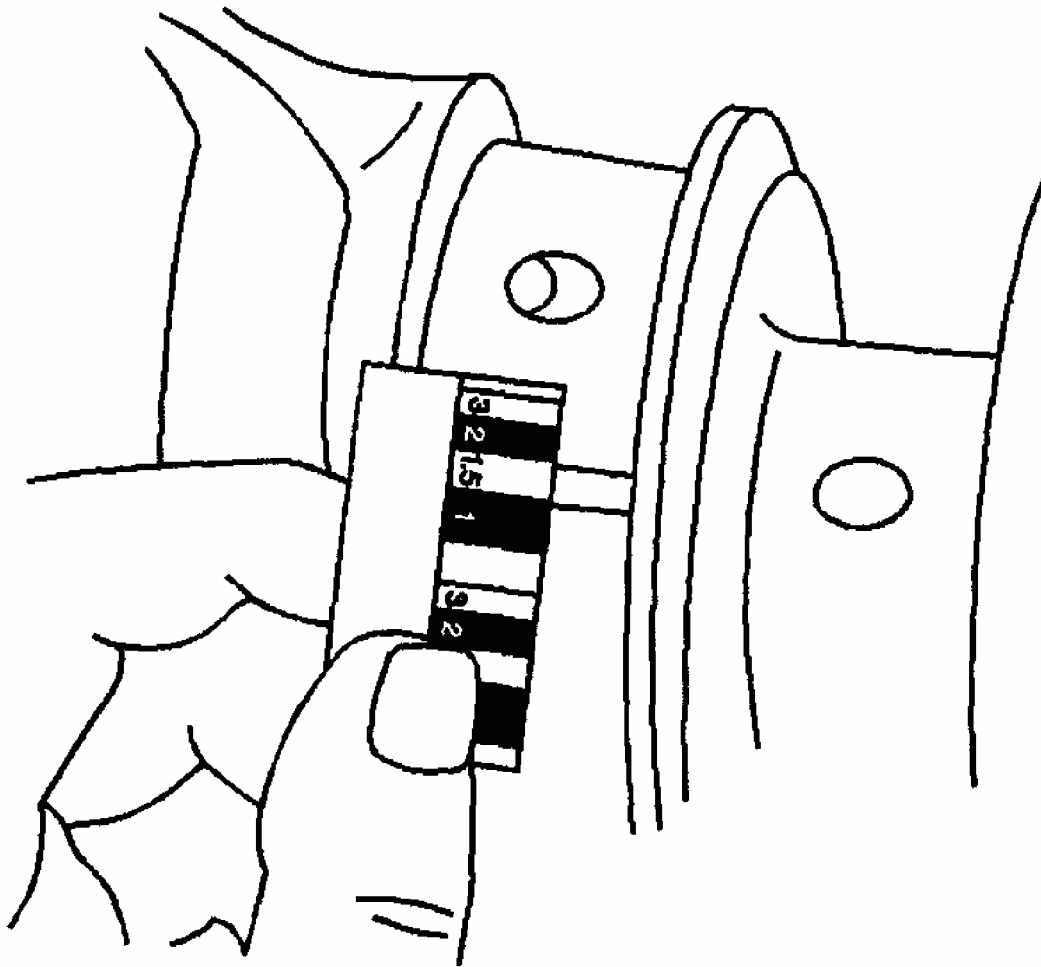
G02502898

Fig. 161: Crankshaft Bearing Caps
Courtesy of GENERAL MOTORS CORP.

9. Without removing the gaging plastic, measure the compressed width at the widest point using the graduated scale on the edge of the gaging plastic envelope.

If the flattened gaging plastic tapers toward the middle or the ends, there may be a difference in clearance indicating taper, low spot or other irregularity of the crankshaft bearing or the crankshaft bearing journal.

10. Remove the flattened gaging plastic.
11. Measure the remaining crankshaft bearing journals.

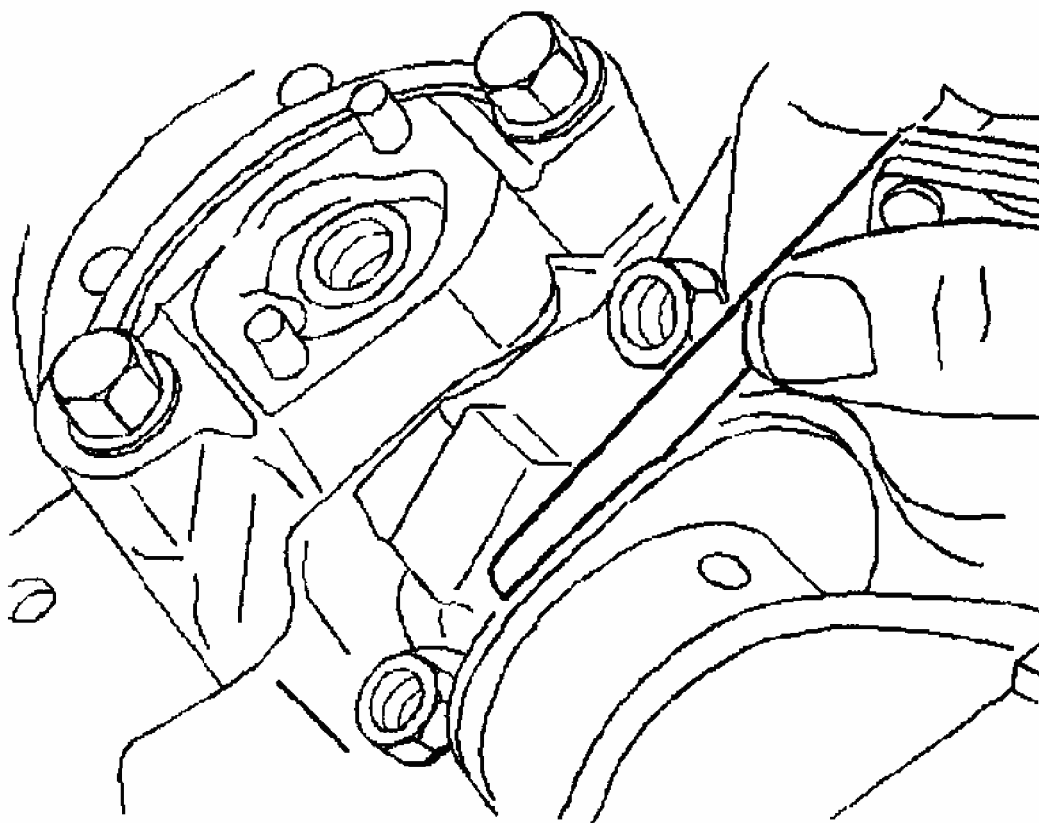


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Fig. 162: Measuring Remaining Crankshaft Bearing Journals
Courtesy of GENERAL MOTORS CORP.

Measuring Connecting Rod Bearing Side Clearance

1. Insert a feeler gage between the connecting rod caps and measure the connecting rod side clearance. The proper connecting rod side clearance specification is 0.15-0.44 mm (0.006-0.017 in).
2. Connecting rod side clearances may also be measured with a dial indicator set.



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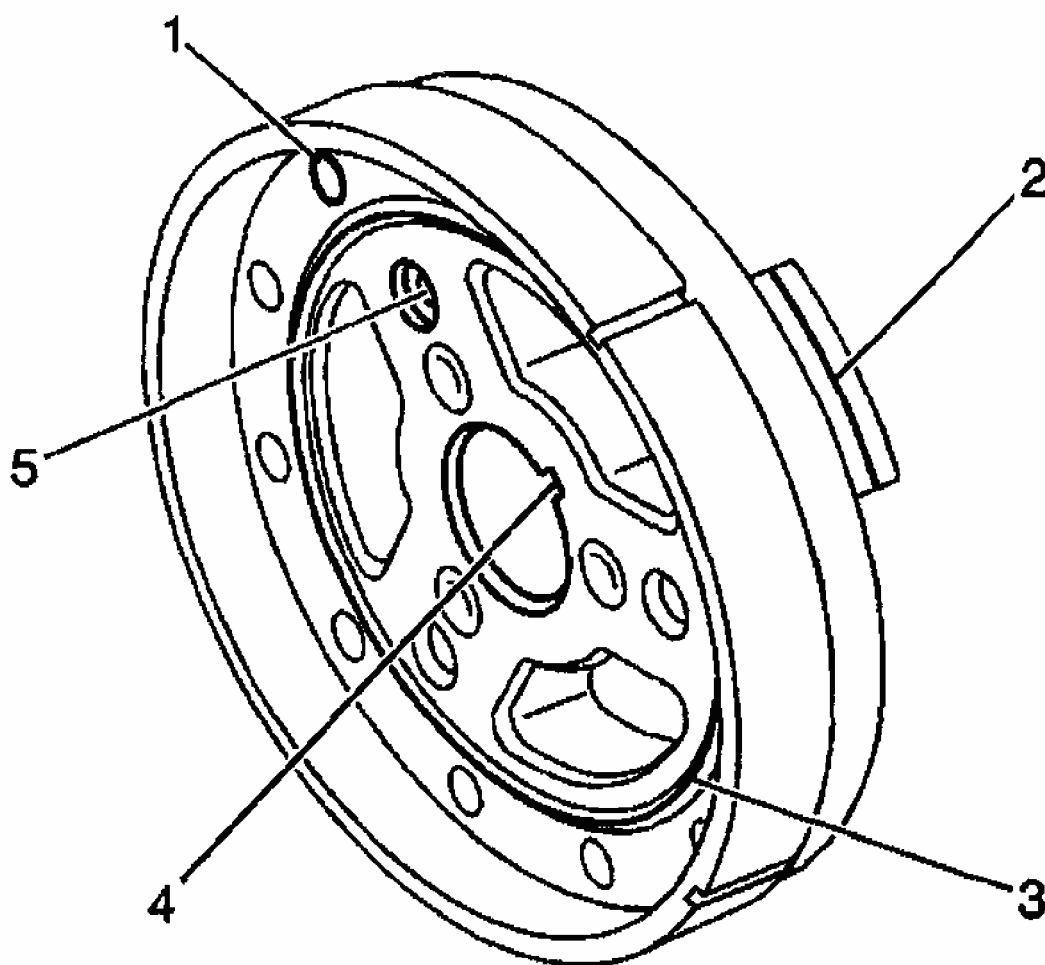
Fig. 163: Measuring Connecting Rod Bearing Side Clearance
Courtesy of GENERAL MOTORS CORP.

CRANKSHAFT BALANCER CLEANING AND INSPECTION

1. Clean the crankshaft balancer in cleaning solvent.
2. Dry the crankshaft balancer with compressed air.
3. Inspect the crankshaft balancer for the following:
 - Loose or improperly installed crankshaft balancer front groove pin (1)

A properly installed front groove pin should be installed until flush or below flush with the face of the crankshaft balancer.

Important: A crankshaft front oil sealing surface with excessive scoring, grooves, rust, or other damage must be replaced.



G02502901

Fig. 164: Inspecting Crankshaft Balancer
Courtesy of GENERAL MOTORS CORP.

- Worn, grooved, or damaged crankshaft front oil sealing surface (2). Minor imperfections on the crankshaft balancer crankshaft front oil seal surface may be removed with a polishing compound or fine grade emery cloth.
- Worn, chunking, or deteriorated rubber (3) between the hub and the outer ring
- Worn or damaged keyway (4)

ENGINE FLYWHEEL CLEANING & INSPECTION

1. Clean the engine flywheel (1 or 2) in cleaning solvent.
2. Dry the engine flywheel with compressed air.

Important: Do not attempt to repair the welded areas, if present, that retain the ring

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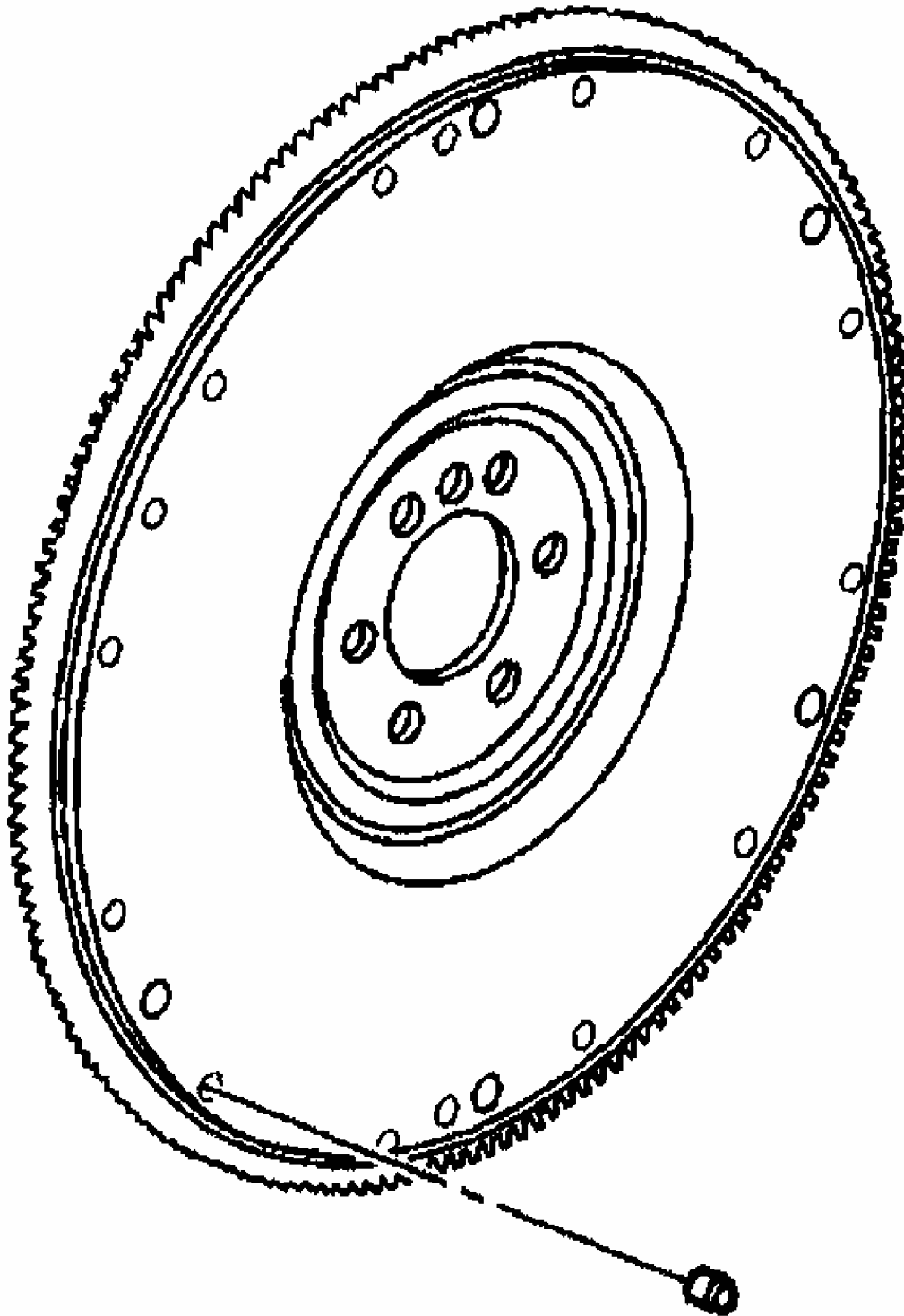
2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

gear to the engine flywheel plate. Always install a NEW engine flywheel.

3. Inspect the engine flywheel, automatic transmission, if equipped, for the following:
 - Stress cracks around the engine flywheel-to-torque converter bolt hole locations (1)
 - Missing balance weights
 - Stress cracks around the engine flywheel-to-crankshaft bolt hole locations (2 or 3)
 - Welded areas that retain the ring gear onto the engine flywheel for cracking (4), if present
 - Damaged ring gear teeth (5)
4. Inspect the engine flywheel, manual transmission, if equipped, for loose or improperly installed flywheel weights, if applicable. A properly installed flywheel weight should be installed until flush or below flush with the face of the engine flywheel.

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

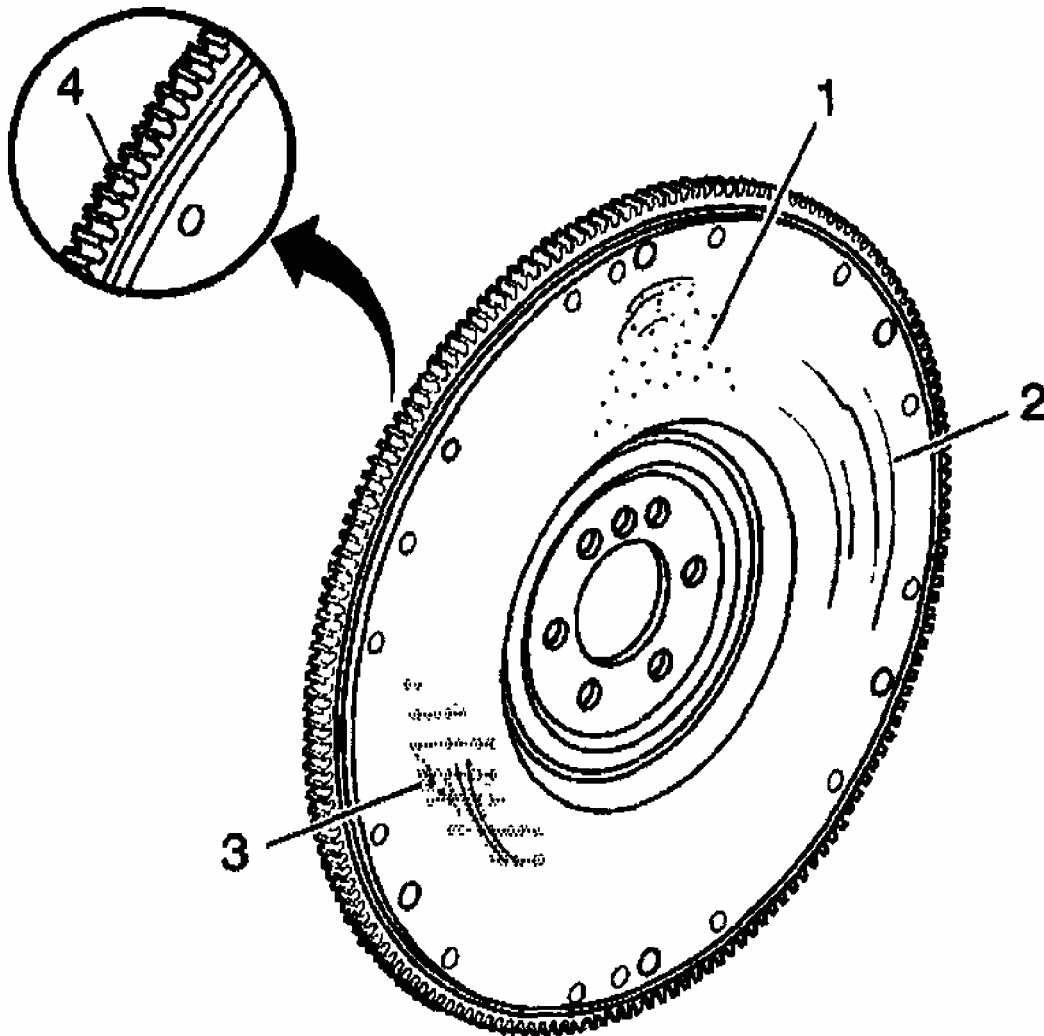


G02502904

Fig. 165: Flywheel Weight

Courtesy of GENERAL MOTORS CORP.

5. Inspect the engine flywheel, manual transmission, if equipped, for the following:
 - Pitted friction surface (1)
 - Scoring or grooves (2)
 - Rust or other surface damage (3)
 - Damaged ring gear teeth (4)
 - Loose or improperly positioned ring gear. The ring gear has an interference fit onto the engine flywheel and the ring gear should be positioned completely flat against the flange of the engine flywheel.



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Fig. 166: Inspecting Engine Flywheel (M/T)

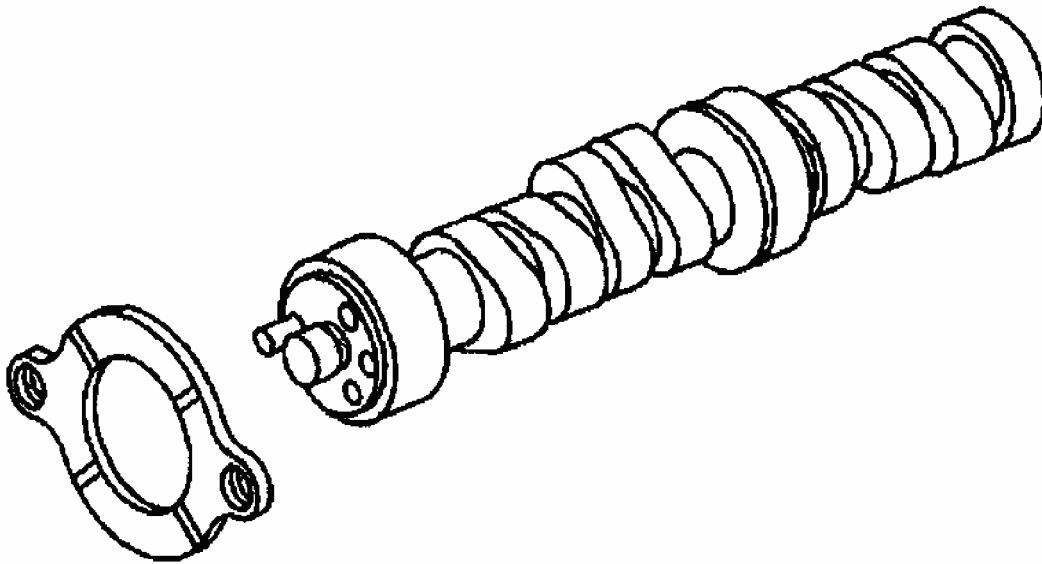
Courtesy of GENERAL MOTORS CORP.

CAMSHAFT & BEARINGS CLEANING & INSPECTION

Tools Required

J 7872 Magnetic Base Dial Indicator

1. Clean the engine camshaft in cleaning solvent.
2. Dry the engine camshaft with compressed air.
3. Inspect the camshaft retainer plate for damage. If the camshaft retainer plate is damaged, replace as necessary.



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Fig. 167: Camshaft Retainer Plate

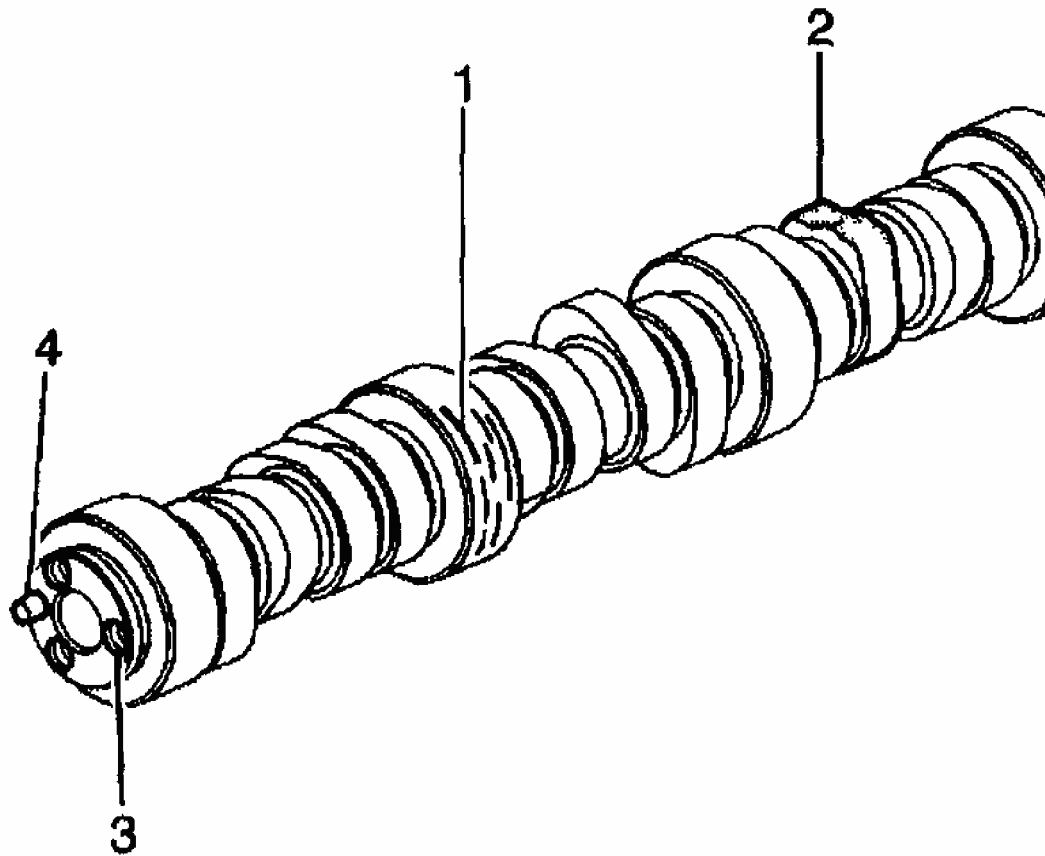
Courtesy of GENERAL MOTORS CORP.

4. Inspect the camshaft bearings for correct fit into the engine block camshaft bearing bores. The camshaft bearings have an interference fit to the engine block camshaft bearing bores and must not be loose in the engine block camshaft bearing bores.

Important: If any camshaft bearing is excessively worn or scored, replace all the camshaft bearings.

5. Inspect the camshaft bearings for excessive wear or scoring.
6. Inspect the engine camshaft for the following:

- Worn, scored, or damaged bearing journals (1)
- Worn engine camshaft lobes (2)
- Damaged bolt hole threads (3)
- Damaged camshaft sprocket locator pin (4)

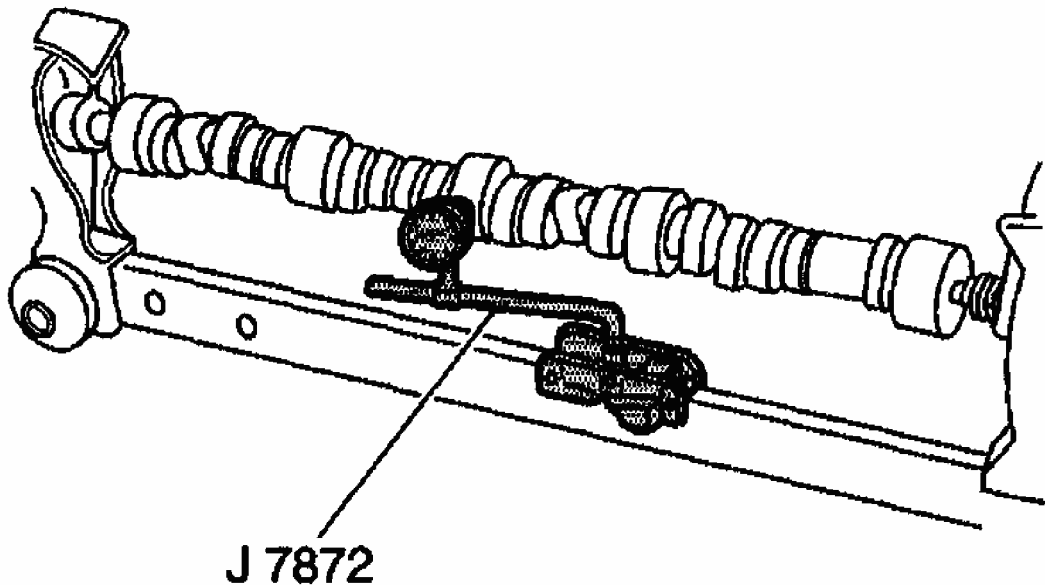


G02502907

Fig. 168: Inspecting Engine Camshaft
Courtesy of GENERAL MOTORS CORP.

7. Measure the engine camshaft journals with a micrometer. If the camshaft journals are more than 0.025 mm (0.0010 in) out-of-round, then replace the engine camshaft.
8. Measure for a bent engine camshaft or excessive engine camshaft runout using the **J 7872**.
 - 8.1. Mount the engine camshaft in a suitable stand between centers.
 - 8.2. Use the **J 7872** in order to check the intermediate engine camshaft journals. If the runout exceeds 0.065 mm (0.0026 in), the engine camshaft is bent and must be replaced.

9. Measure the engine camshaft lobe lift using the **J 7872** .
 - 9.1. Place the engine camshaft on the V-blocks.
 - 9.2. Use the **J 7872** in order to measure the engine camshaft lobe lift.



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Fig. 169: Measuring Engine Camshaft Lobe
Courtesy of GENERAL MOTORS CORP.

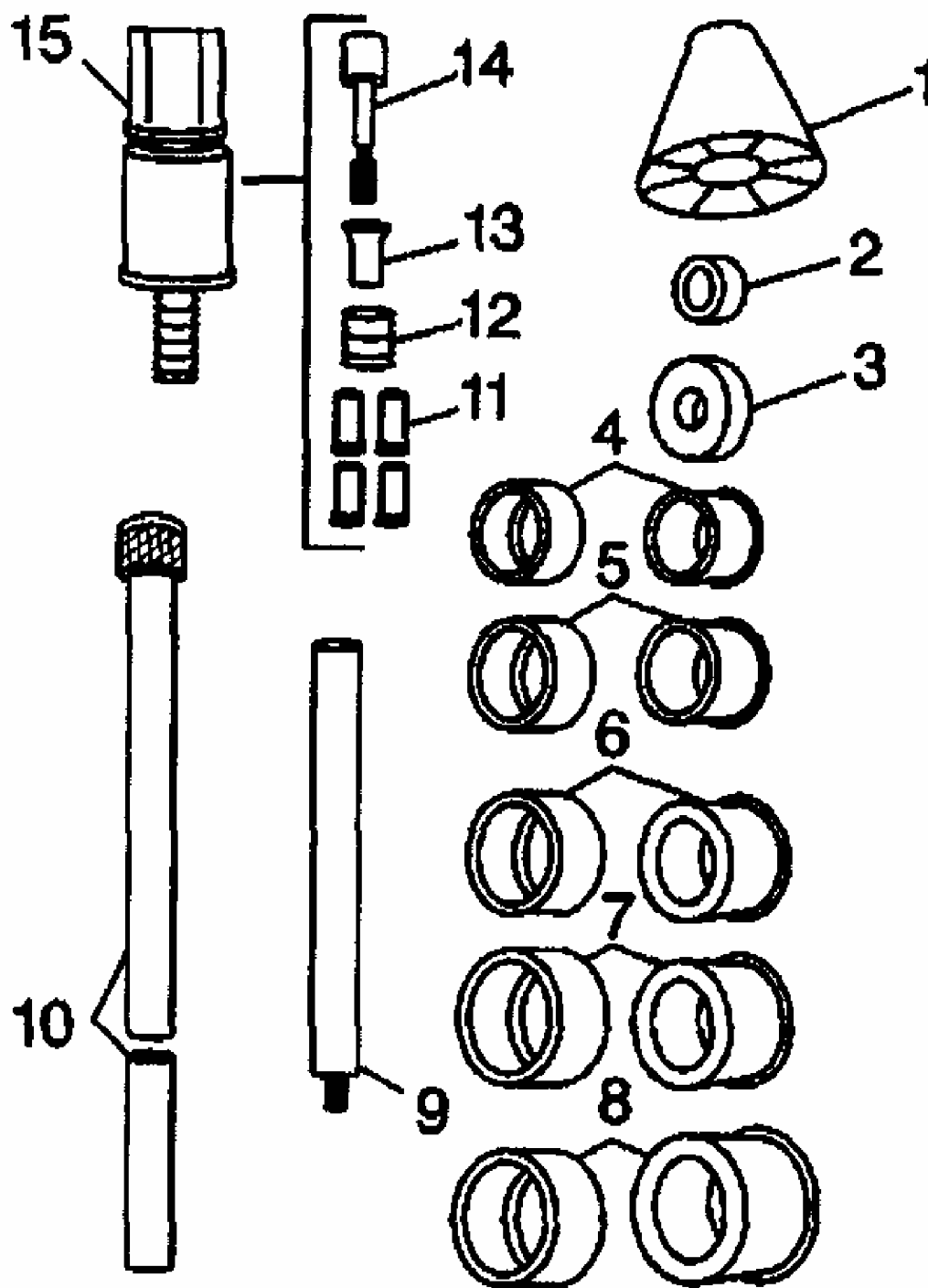
10. Replace the engine camshaft if the engine camshaft lobe lift is not within specifications. Refer to **Engine Mechanical Specifications** .

CAMSHAFT BEARING REMOVAL

Tools Required

J 33049 Camshaft Bearing Service Kit

1. Select the cone (1), the handle (10), the expanding driver (4-8), the washer (2 or 3), and the expander assembly (15) from the **J 33049** .
2. Assemble the **J 33049** .



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Fig. 170: Camshaft Bearing Service Kit
 Courtesy of GENERAL MOTORS CORP.

Important:

- A loose camshaft bearing may be caused by an enlarged, out-of-round, or damaged engine block camshaft bearing bore.
- Always remove the camshaft inner bearings #2 and #3 first. The camshaft outer bearings #1 and #4 serve as a guide for the **J 33049**.

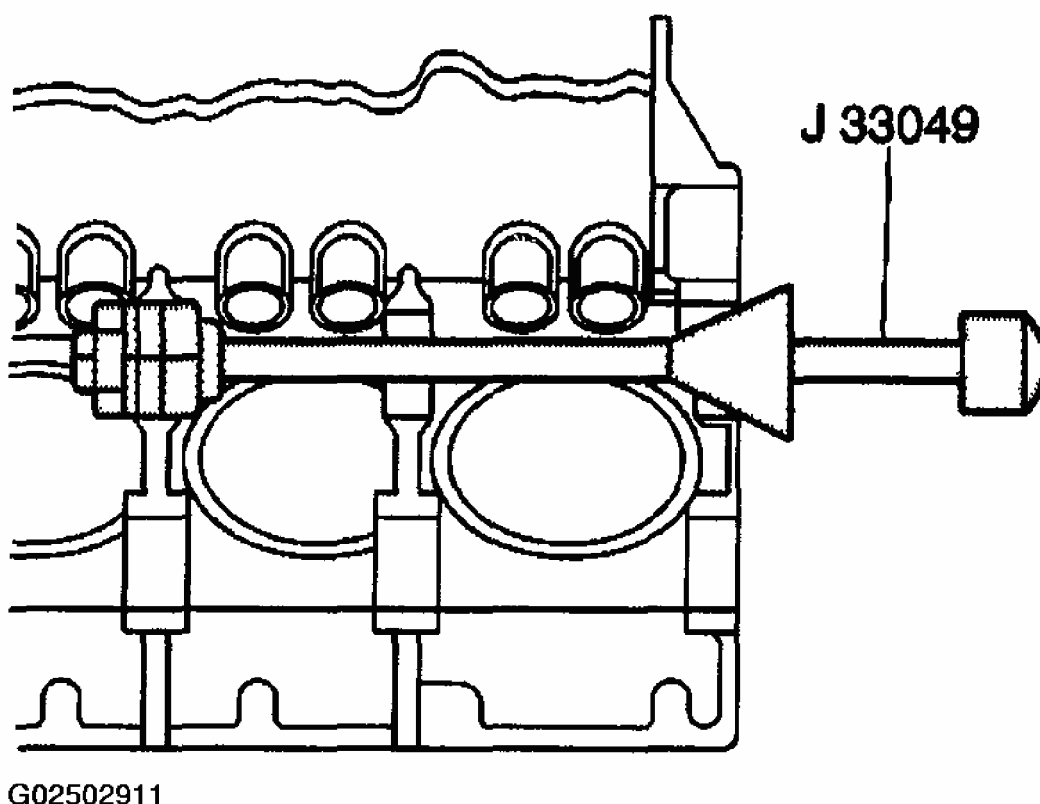


Fig. 171: Removing Camshaft Inner Bearings
Courtesy of GENERAL MOTORS CORP.

3. Remove the camshaft inner bearings #2 and #3.
 - 3.1. Insert the **J 33049** through the front of the engine block and into the camshaft inner bearing #2.
 - 3.2. Tighten the **J 33049** expander assembly nut until snug.
 - 3.3. Push the **J 33049** guide cone into the camshaft front bearing in order to align the **J 33049**.
 - 3.4. Drive the camshaft inner bearing #2 from the camshaft inner bearing bore #2.
 - 3.5. Loosen the **J 33049** expander assembly nut.
 - 3.6. Remove the camshaft inner bearing #2 from the **J 33049** expander assembly.

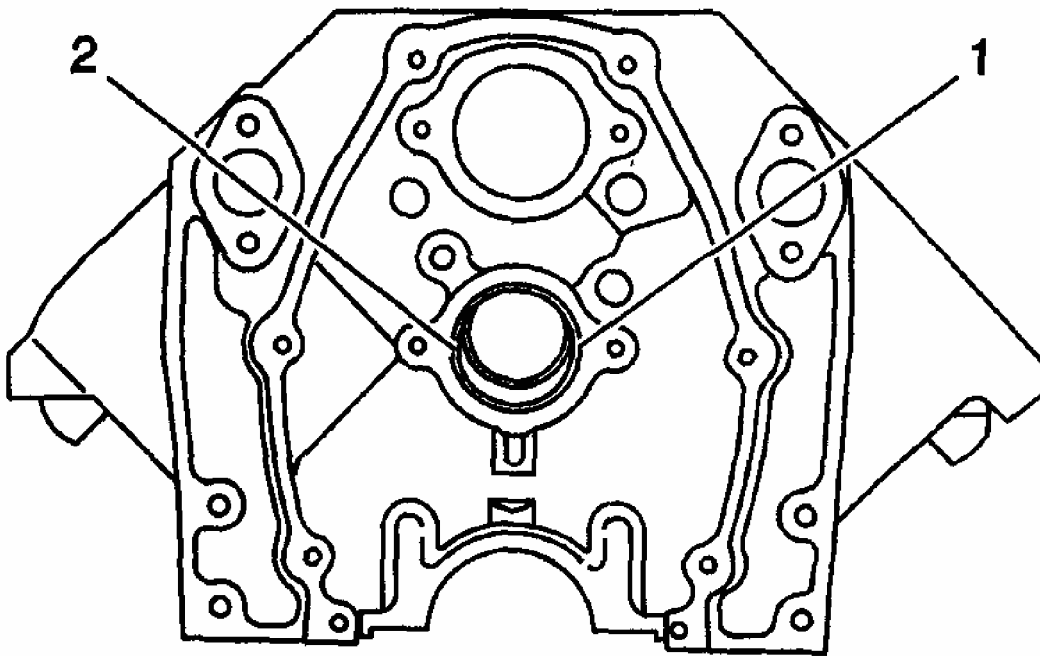
- 3.7. Insert the **J 33049** expander assembly into the camshaft inner bearing #3.
- 3.8. Tighten the **J 33049** expander assembly nut until snug.
- 3.9. Push the **J 33049** guide cone into the camshaft front bearing in order to align the **J 33049**.
- 3.10. Drive the camshaft inner bearing #3 from the camshaft inner bearing bore #3.
- 3.11. Loosen the **J 33049** expander assembly nut.
- 3.12. Remove the camshaft inner bearing #3 from the **J 33049** expander assembly.
4. Remove the **J 33049** from the engine block.
5. Remove the camshaft outer bearings #1 and #4.
 - 5.1. Insert the **J 33049** into the camshaft outer bearing #1.
 - 5.2. Tighten the **J 33049** expander assembly nut until snug.
 - 5.3. Drive the camshaft outer bearing #1 from the camshaft outer bearing bore #1.
 - 5.4. Loosen the **J 33049** expander assembly nut.
 - 5.5. Remove the camshaft outer bearing #1 from the **J 33049** expander assembly.
 - 5.6. Remove the **J 33049** from the engine block.
 - 5.7. Insert the **J 33049** into the camshaft outer bearing #4.
 - 5.8. Tighten the **J 33049** expander assembly nut until snug.
 - 5.9. Drive the camshaft outer bearing #4 from the camshaft outer bearing bore #4.
 - 5.10. Loosen the **J 33049** expander assembly nut.
 - 5.11. Remove the camshaft outer bearing #4 from the **J 33049** expander assembly.
6. Remove the **J 33049** from the engine block.
7. Discard the camshaft bearings.

CAMSHAFT BEARING INSTALLATION

Tools Required

J 33049 Camshaft Bearing Service Kit

Important: When installing the camshaft bearings, always look in order to ensure that the camshaft bearing lubrication hole is located above the 3 o'clock position (1) or the 9 o'clock position (2). The proper positioning of the camshaft bearing lubrication hole is in order to ensure the best lubrication of the engine camshaft journals.

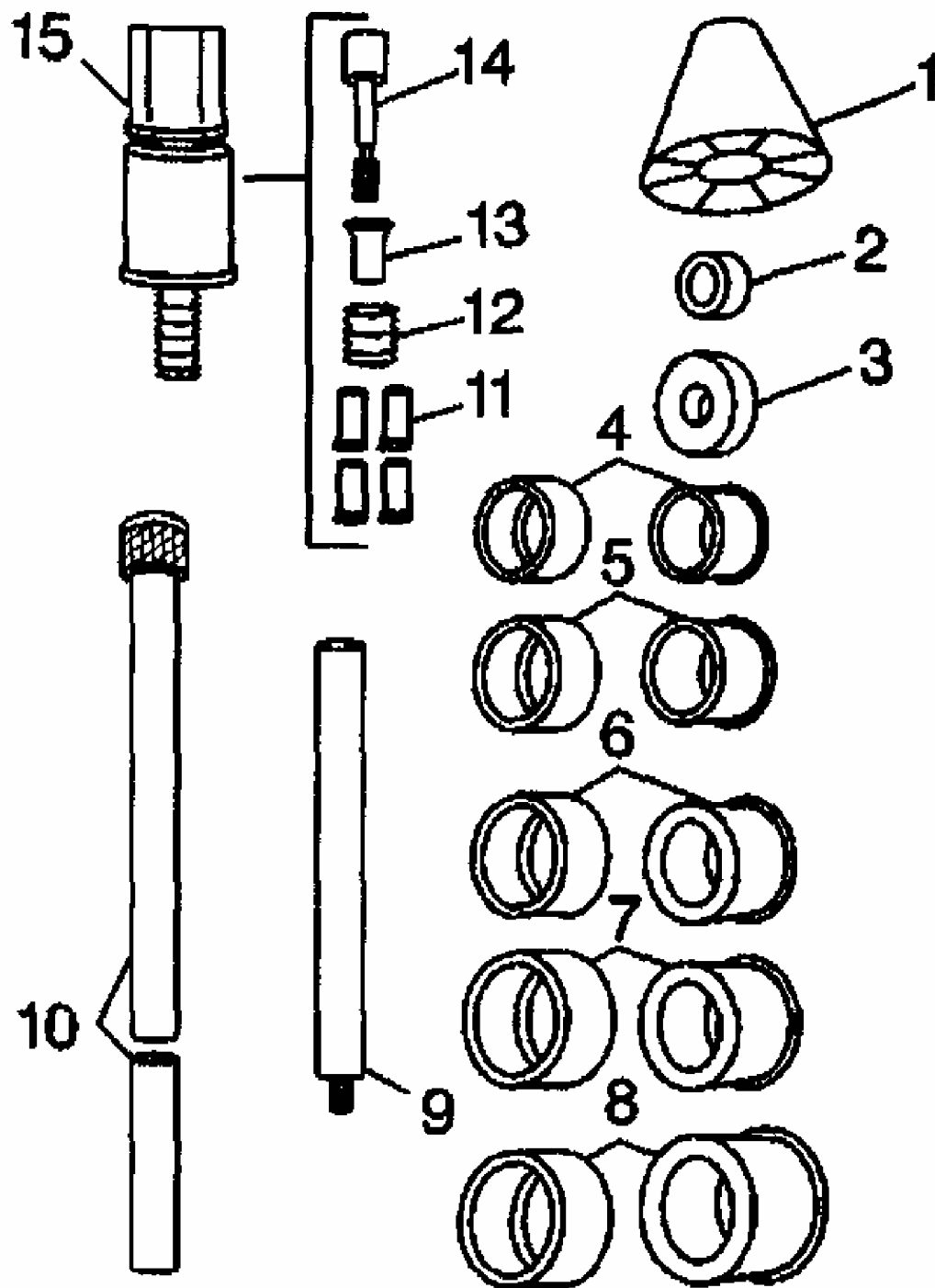


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Fig. 172: Camshaft Bearing

Courtesy of GENERAL MOTORS CORP.

1. Assemble the **J 33049** handle (10), the expanding driver (4-8), the washer (2 or 3), and the expander assembly (15).



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Fig. 173: Camshaft Bearing Service Kit
 Courtesy of GENERAL MOTORS CORP.

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Important: The camshaft bearings vary in size. When ordering the new camshaft bearings, be sure to order the correct camshaft bearings for the application to be serviced.

Always install the camshaft outer bearings #1 and #4 first. The camshaft outer bearings serve as a guide for the **J 33049** and help center the camshaft inner bearings during the installation process.

2. Install the NEW camshaft outer bearings #4 and #1.
 - 2.1. Install the NEW camshaft outer bearing #4 onto the **J 33049** expander assembly.
 - 2.2. Tighten the **J 33049** expander assembly nut until snug.
 - 2.3. Align the lubrication hole of the camshaft outer bearing #4 above the 3 o'clock position or the 9 o'clock position of the camshaft outer bearing bore #4 at the rear of the engine block.
 - 2.4. Drive the camshaft outer bearing #4 into the camshaft outer bearing bore #4 at the rear of the engine block.
 - 2.5. Loosen the **J 33049** expander assembly nut.
 - 2.6. Remove the camshaft outer bearing #4 from the **J 33049** expander assembly.
 - 2.7. Install the NEW camshaft outer bearing #1 onto the **J 33049** expander assembly.
 - 2.8. Tighten the **J 33049** expander assembly nut until snug.
 - 2.9. Align the lubrication hole of the camshaft outer bearing #1 above the 3 o'clock position or the 9 o'clock position of the camshaft outer bearing bore #1 at the front of the engine block.
 - 2.10. Drive the camshaft outer bearing #1 into the camshaft outer bearing bore #1 at the front of the engine block.
 - 2.11. Loosen the **J 33049** expander assembly nut.
 - 2.12. Carefully slide the **J 33049** into the engine block until the **J 33049** expander assembly is positioned between the camshaft inner bearing bores.
3. Install the NEW camshaft inner bearings #3 and #2.
 - 3.1. Install the NEW camshaft inner bearing #3 onto the **J 33049** expander assembly.
 - 3.2. Tighten the **J 33049** expander assembly nut until snug.
 - 3.3. Align the lubrication hole of the camshaft inner bearing #3 above the 3 o'clock position or the 9 o'clock position of the camshaft inner bearing bore #3 of the engine block.
 - 3.4. Push the **J 33049** guide cone into the camshaft front bearing bore #1 in order to align the **J 33049**.
 - 3.5. Drive the camshaft inner bearing #3 into the camshaft inner bearing bore #3.

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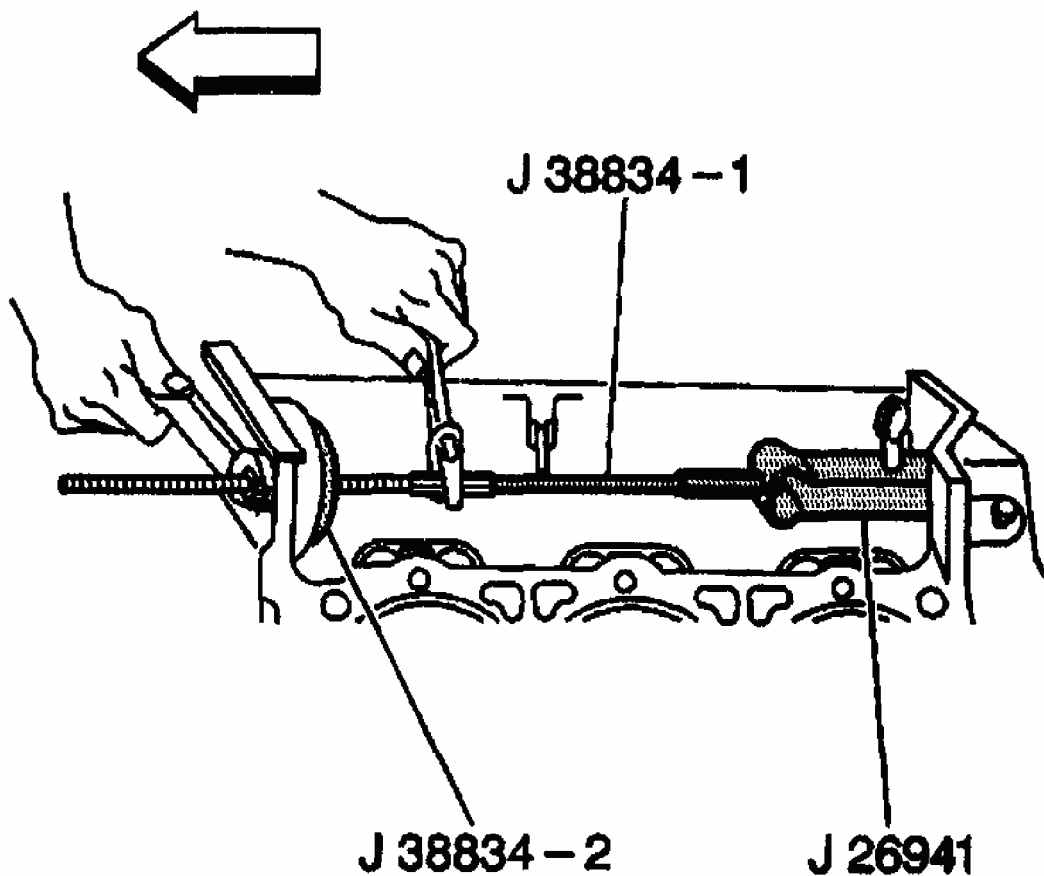
2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

- 3.6. Loosen the **J 33049** expander assembly nut.
- 3.7. Carefully slide the **J 33049** until the **J 33049** expander assembly is positioned between the camshaft inner bearing bore #2 and the camshaft outer bearing bore #1.
- 3.8. Install the NEW camshaft inner bearing #2 onto the **J 33049** expander assembly.
- 3.9. Tighten the **J 33049** expander assembly nut until snug.
- 3.10. Align the lubrication hole of the camshaft inner bearing #2 above the 3 o'clock position or the 9 o'clock position of the camshaft inner bearing bore #2 of the engine block.
- 3.11. Push the **J 33049** guide cone into the camshaft front bearing bore #1 in order to align the **J 33049**.
- 3.12. Drive the camshaft inner bearing #2 into the camshaft inner bearing bore #2.
- 3.13. Loosen the **J 33049** expander assembly nut.
4. Carefully remove the **J 33049** from the engine block.

BALANCE SHAFT BEARING AND/OR BUSHING REMOVAL

Tools Required

- **J 26941** Bushing/Bearing Remover
 - **J 38834** Balance Shaft Service Kit
1. Use the **J 38834** and the **J 26941** in order to remove the balance shaft rear bearing.
 - 1.1. Install **J 26941** legs behind the balance shaft rear bearing and secure.
 - 1.2. Install the **J 38834-1** with the short threaded end through the balance shaft bore in the front of the engine block.
 - 1.3. Install the **J 38834-1** into **J 26941**.
 - 1.4. Slide the **J 38834-2** onto the **J 38834-1** and into the balance shaft bore of the engine block.
 - 1.5. Install the **J 38834** bearing, washer, and nut onto the **J 38834-1**.
 - 1.6. Using a wrench secure the **J 38834-1** and then rotate the **J 38834** nut clockwise until the balance shaft rear bearing is removed from the engine block.
 - 1.7. Remove the **J 26941** from the balance shaft rear bearing.



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Fig. 174: Removing Balance Shaft Rear Bearing
Courtesy of GENERAL MOTORS CORP.

2. Discard the balance shaft rear bearing.

BALANCE SHAFT CLEANING & INSPECTION

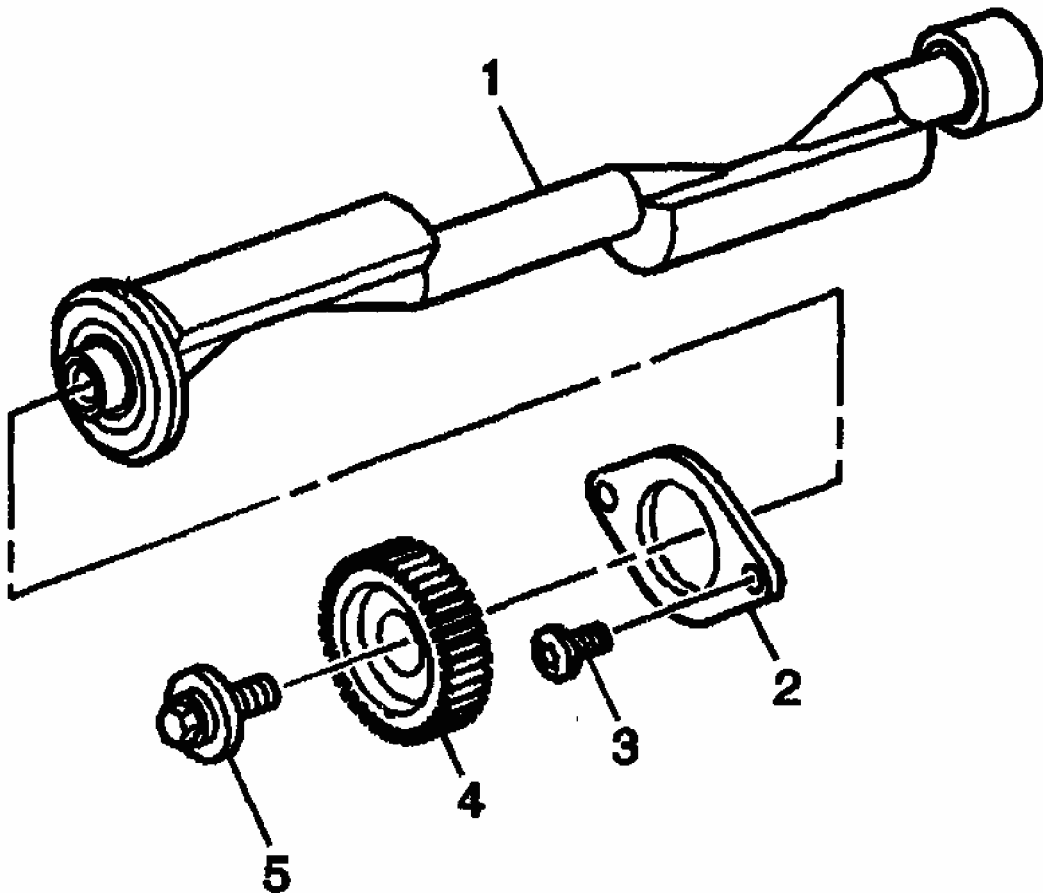
Important: The balance shaft and the balance shaft front bearing are serviced only as an assembly. Do not remove the balance shaft front bearing from the balance shaft.

1. Clean the following components in cleaning solvent:

- The balance shaft (1)
- The balance shaft retainer (2)
- The balance shaft rear bearing
- The balance shaft driven gear (4)
- The balance shaft drive gear

2. Dry the following components with compressed air:

- The balance shaft (1)
 - The balance shaft retainer (2)
 - The balance shaft rear bearing
 - The balance shaft driven gear (4)
 - The balance shaft drive gear
3. Inspect the balance shaft bearings for the following:
- Front ball bearing for damage or wear
 - Front ball bearing for smoothness of operation
 - Rear sleeve bearing for wear, scoring, or other damage



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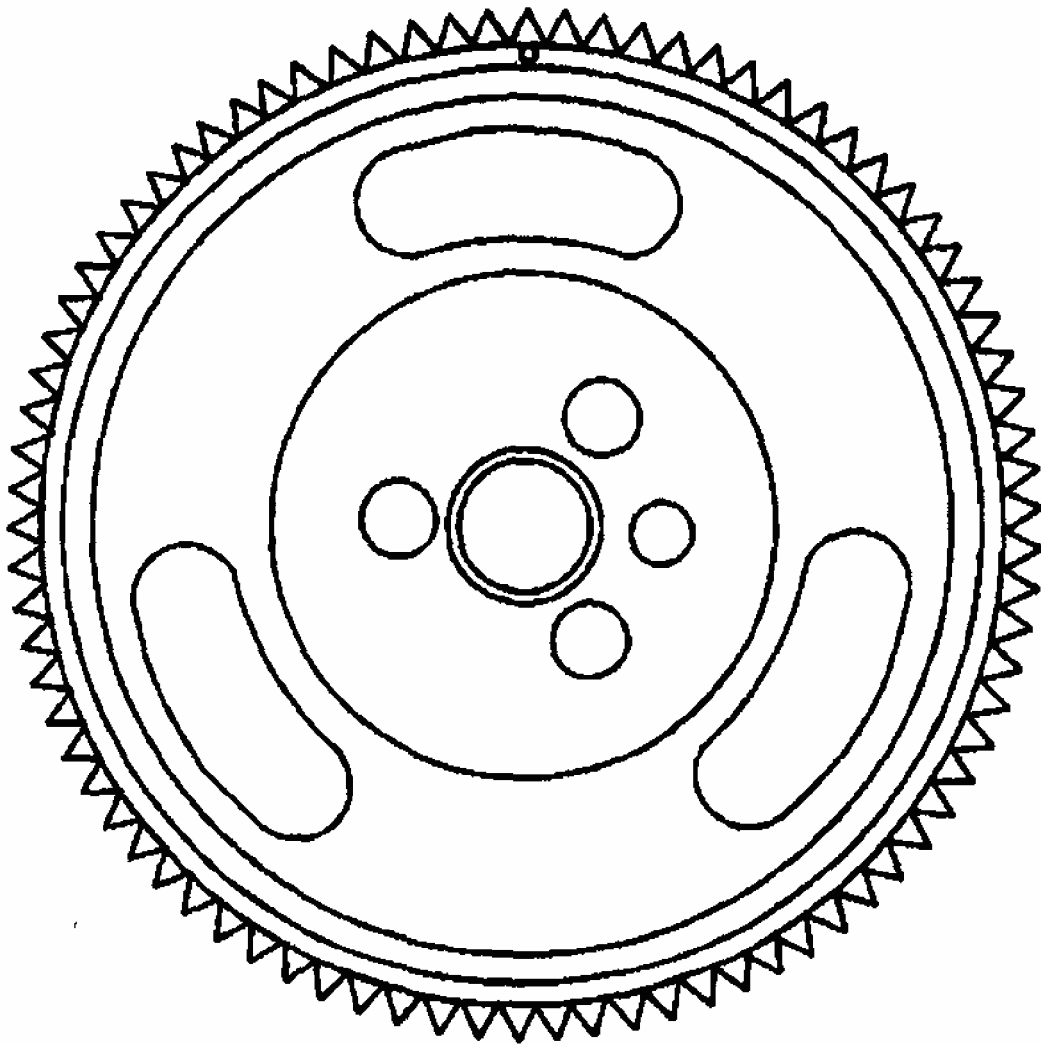
Fig. 175: Balance Shaft Bearings
Courtesy of GENERAL MOTORS CORP.

4. Inspect the balance shaft (1) for the following:

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- Wear or scoring on the rear bearing journal
 - Damaged bolt hole threads
 - Damage to the balance shaft driven gear locator pin
5. Inspect the balance shaft retainer (2) for wear or damage.
 6. Inspect the balance shaft retainer bolts (3) for damaged threads.
 7. Inspect the driven gear (4) for the following:
 - Excessive wear or damage
 - Nicks, burrs, or scoring
 8. Inspect the driven gear bolt (5) for damaged threads.
 9. Inspect the balance shaft drive gear for the following:
 - Excessive wear or damage
 - Nicks, burrs, or scoring



G02502917

Fig. 176: Balance Shaft Drive Gear
Courtesy of GENERAL MOTORS CORP.

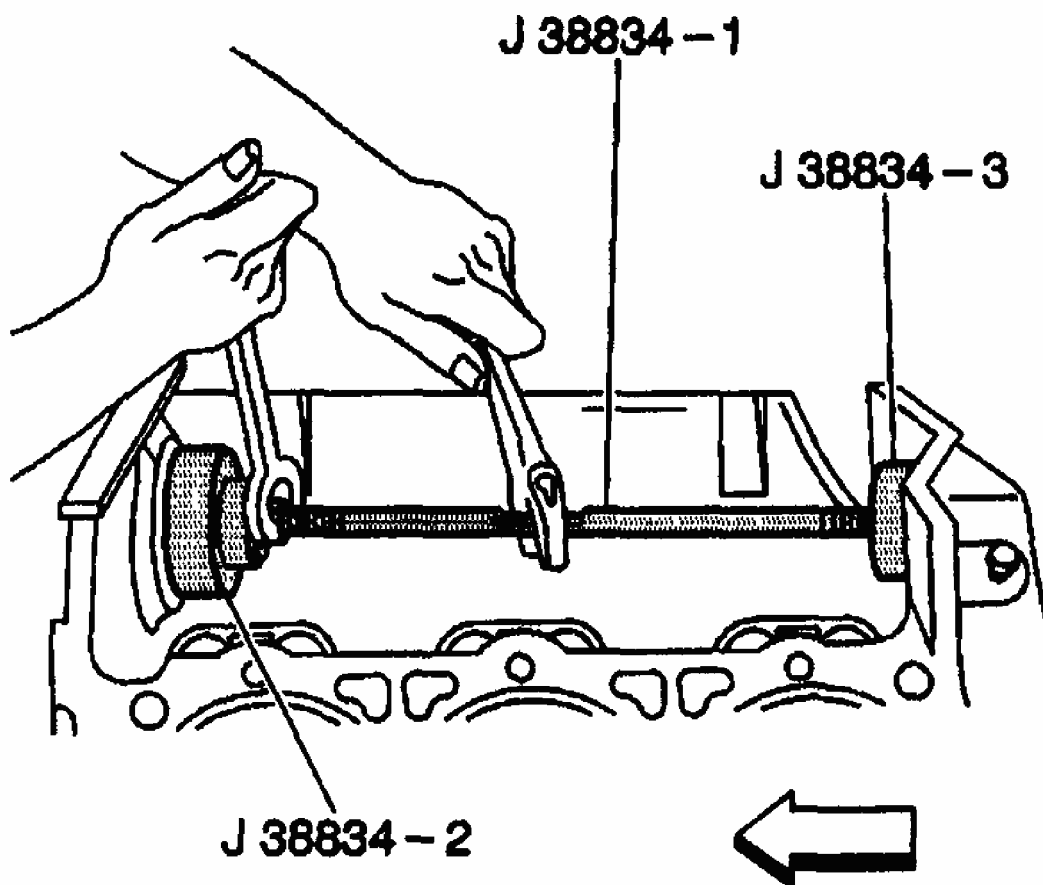
BALANCE SHAFT BEARING AND/OR BUSHING INSTALLATION

Tools Required

J 38834 Balance Shaft Service Kit

1. Use the J 38834 in order to install the balance shaft rear bearing.
 - 1.1. Install the J 38834-3 onto the short threaded end of the J 38834-1.
 - 1.2. Install the J 38834 nut, the washer, and the bearing on the long threaded end of the J 38834-1.

- 1.3. Install the J 38834-2 onto the J 38834-1 so that the smaller diameter of the J 38834-2 will be facing the front of the engine block.
- 1.4. Install the J 38834-2 on the inside of the balance shaft front bearing bore.
- 1.5. Lubricate the NEW balance shaft rear bearing with clean engine oil.
- 1.6. Install the balance shaft rear bearing onto the J 38834-2.

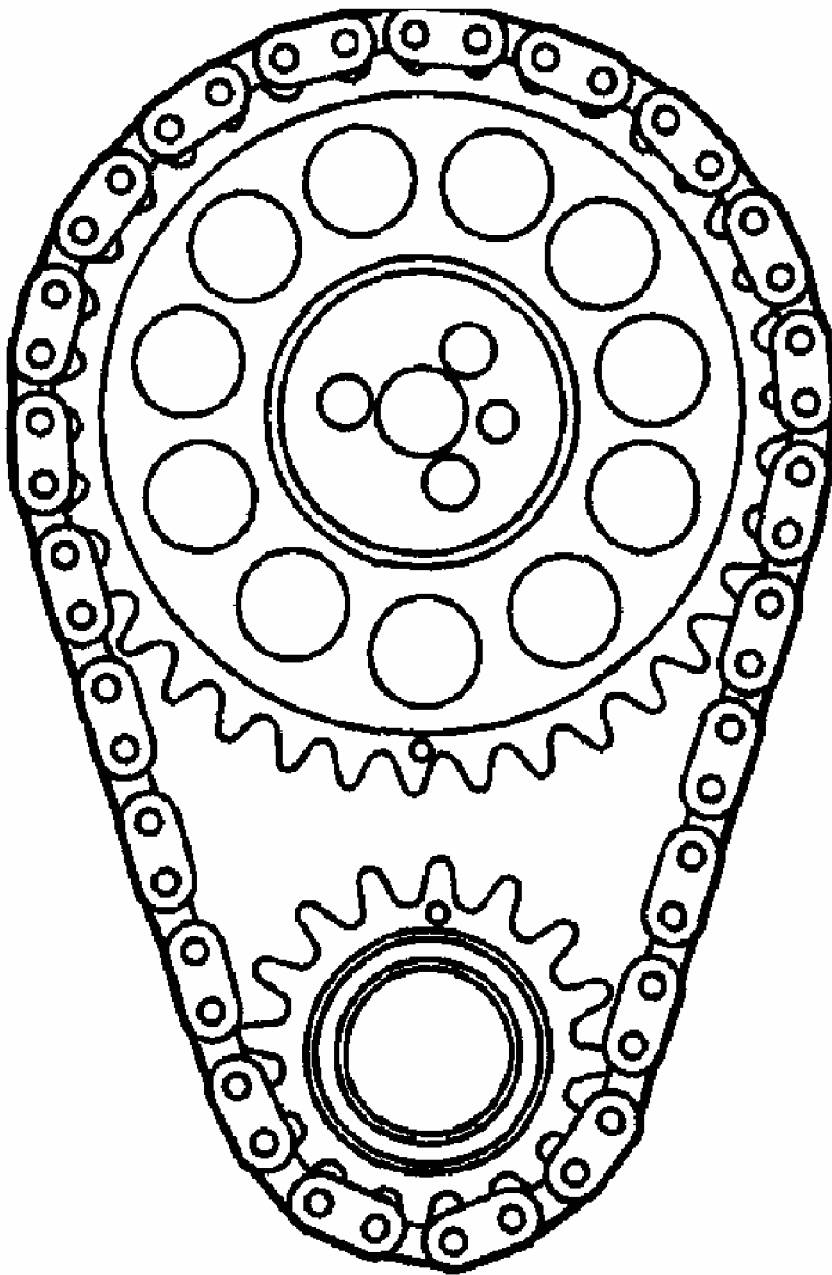


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Fig. 177: Installing Balance Shaft Bearing And/Or Bushing
Courtesy of GENERAL MOTORS CORP.

- 1.7. Align the balance shaft rear bearing for installation.
 - 1.8. Using a wrench secure the J 38834-1 into place.
 - 1.9. Rotate the J 38834 nut until the balance shaft rear bearing is properly and completely pushed into the balance shaft rear bearing bore.
2. Remove the J 38834 .

1. Clean the components with cleaning solvent.
2. Dry the components with compressed air.
3. Inspect the camshaft timing chain for binding or wear.

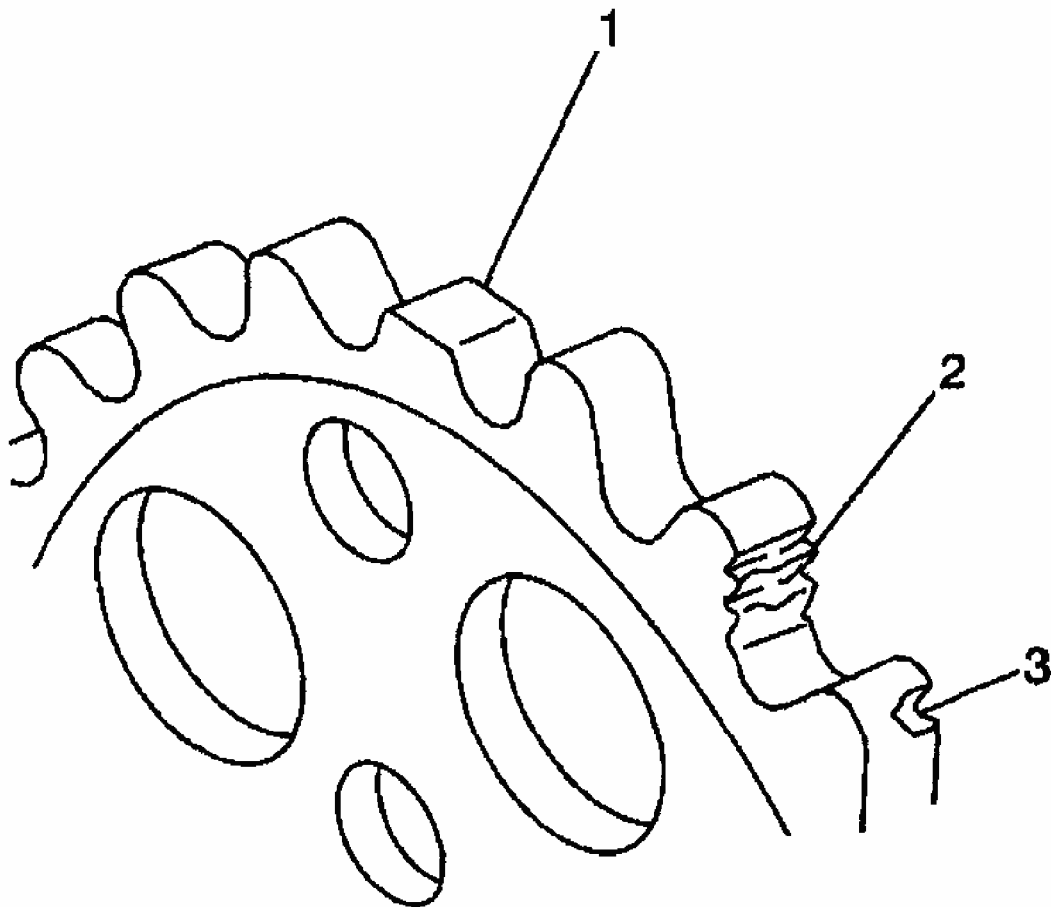


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Fig. 178: Timing Chain & Sprockets
Courtesy of GENERAL MOTORS CORP.

4. Inspect the camshaft sprocket and the crankshaft sprocket for:

- Broken teeth (1)
- Damaged teeth (2)
- Chipped teeth (3)
- Worn teeth
- Uneven wear on the edge of the teeth
- Worn valleys between the sprocket teeth
- Crankshaft sprocket keyway for wear



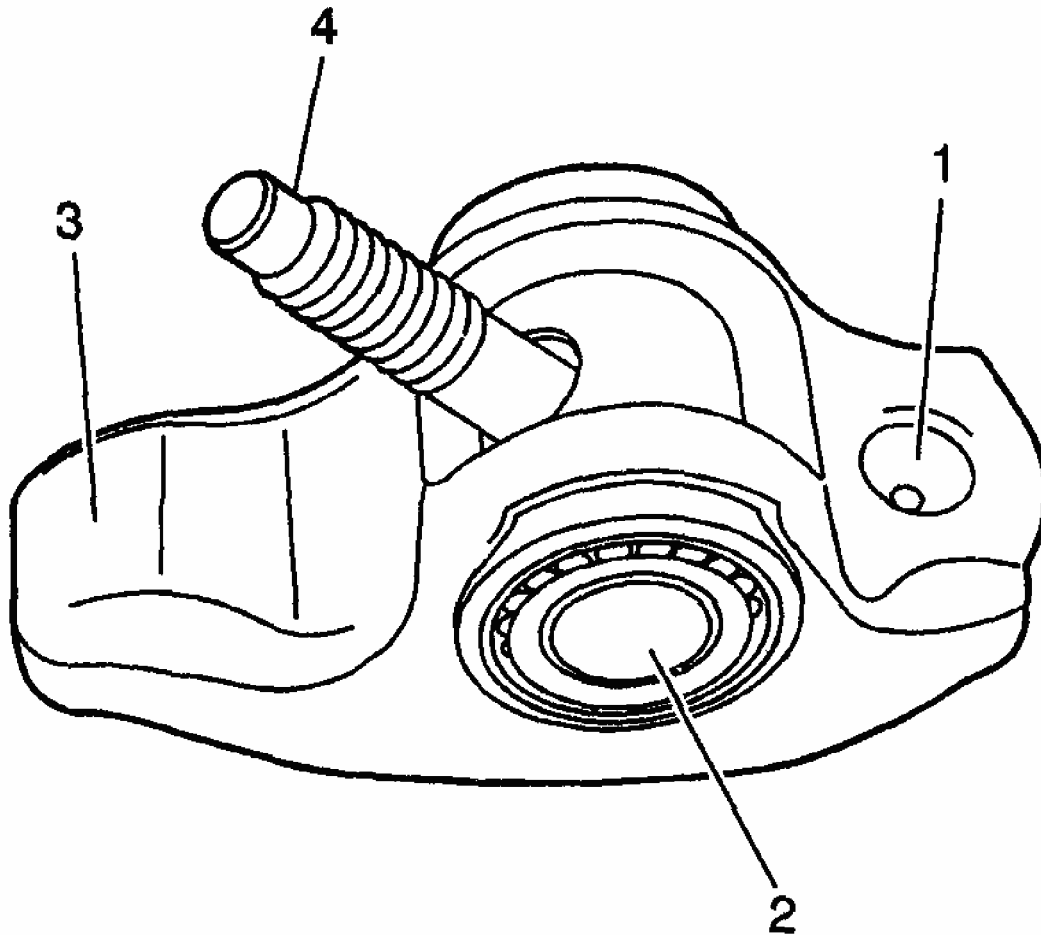
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Fig. 179: Inspecting Camshaft Sprocket & Crankshaft Sprocket For Damage
Courtesy of GENERAL MOTORS CORP.

VALVE ROCKER ARM & PUSH RODS CLEANING & INSPECTION

Important: Parts that are to be reused must be marked, sorted, and organized for assembly.

1. Mark, sort, and organize the components for assembly.
2. Clean the components with cleaning solvent.



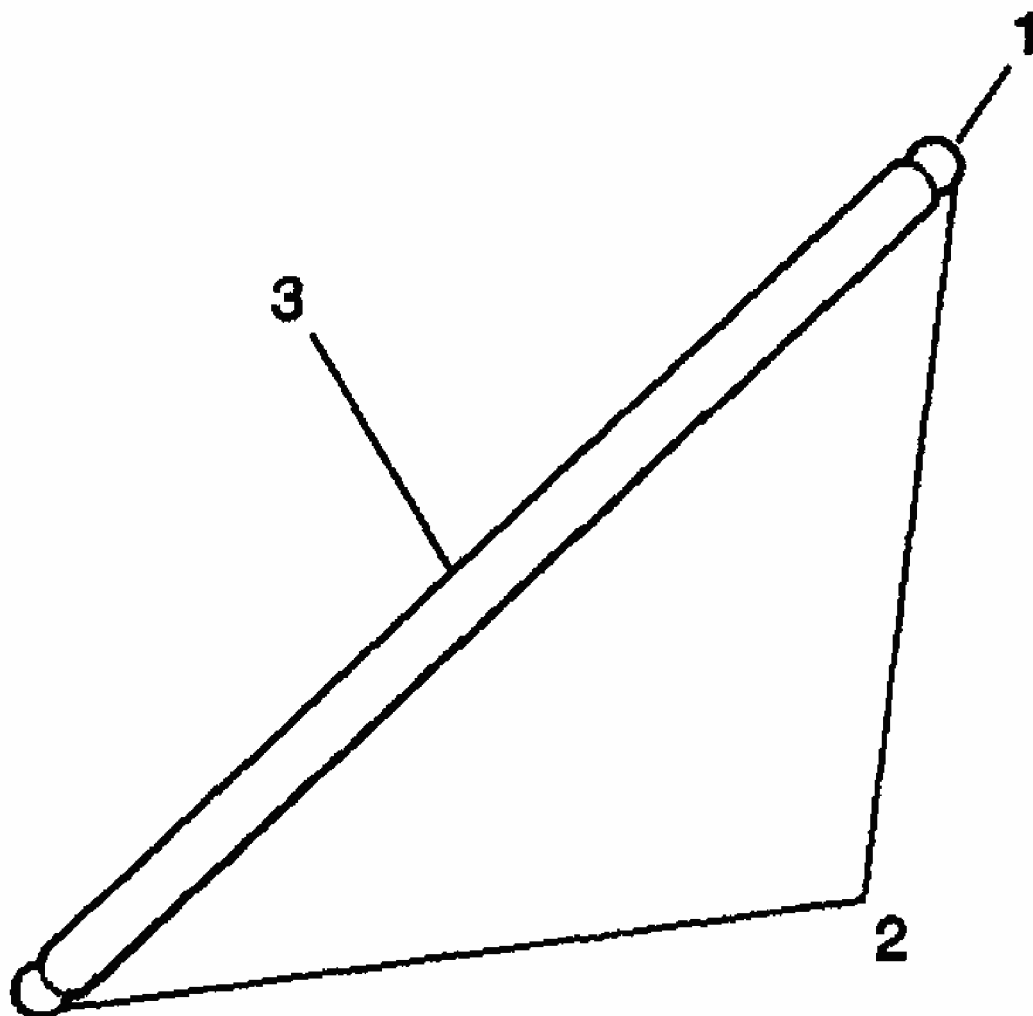
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Fig. 180: Valve Rocker Arm
Courtesy of GENERAL MOTORS CORP.

3. Dry the components with compressed air.
4. Inspect the valve rocker arm components for the following:
 - Valve rocker arm valve pushrod socket contact surface (1)
 - The contact surface must be smooth with no scoring or excessive wear.
 - Valve rocker arm roller pivot for binding or damage (2)
 - Valve rocker arm valve stem contact surface (3). The contact surface should be smooth with no scoring or excessive wear.
 - Valve rocker arm bolt threads for damage (4)

5. Inspect the valve pushrods for the following:

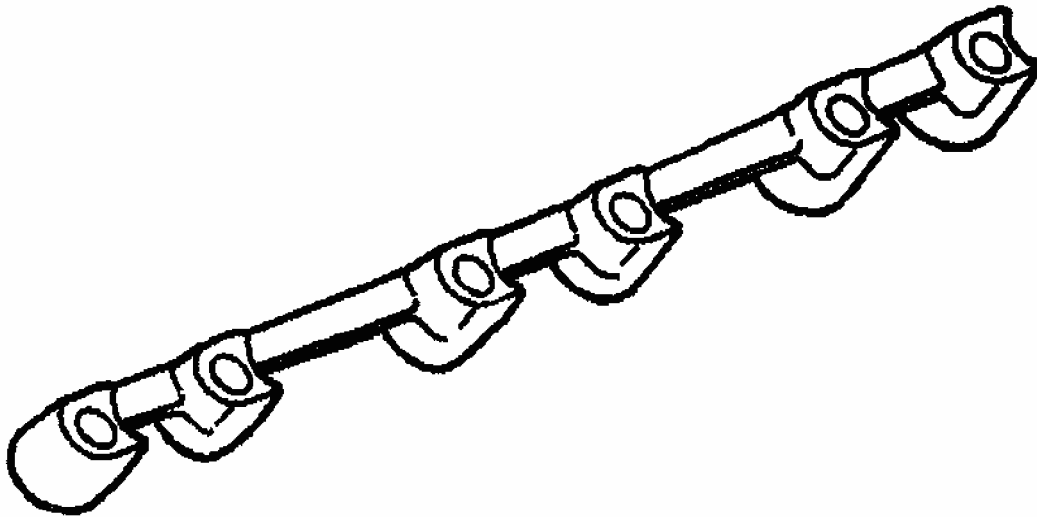
- Restriction of the oil passage (1)
- Wear or scoring of the end contact surfaces (2)
- The end contact surfaces must be smooth with no scoring or excessive wear.
- Shaft for bends (3). Roll the valve pushrod on a flat surface to determine if the valve pushrod is bent.



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Fig. 181: Valve Pushrod
Courtesy of GENERAL MOTORS CORP.

6. Inspect the valve rocker support for excessive wear or damage.

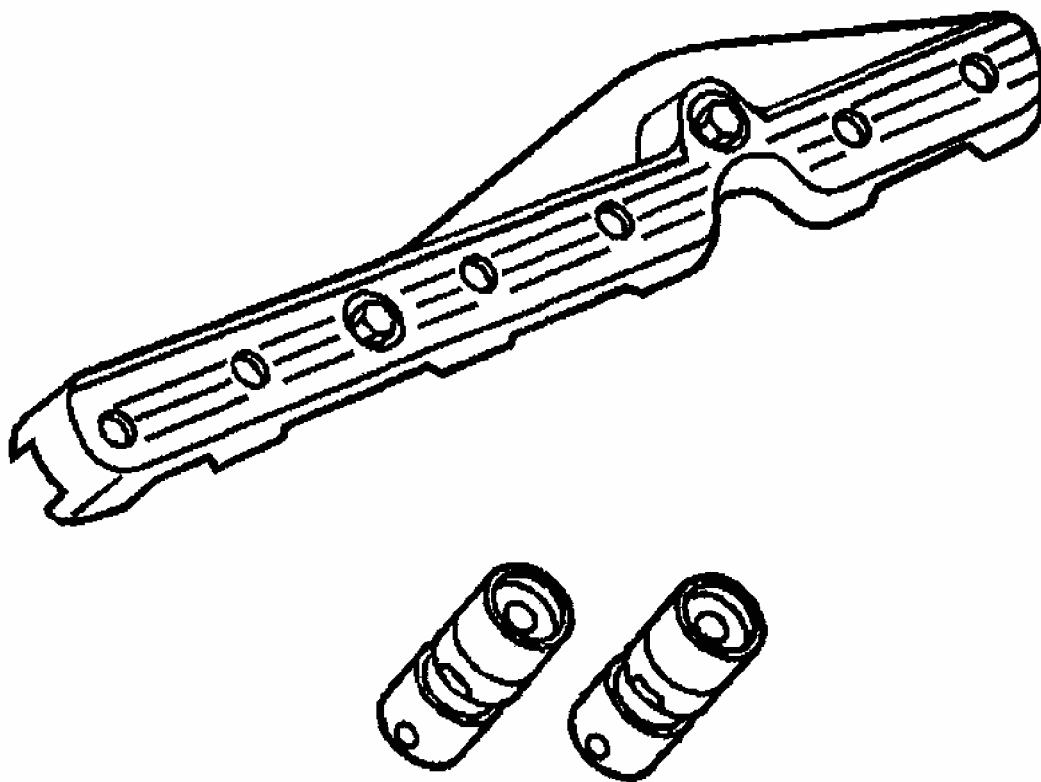


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Fig. 182: Valve Rocker Support
Courtesy of GENERAL MOTORS CORP.

VALVE LIFTERS & GUIDES CLEANING & INSPECTION

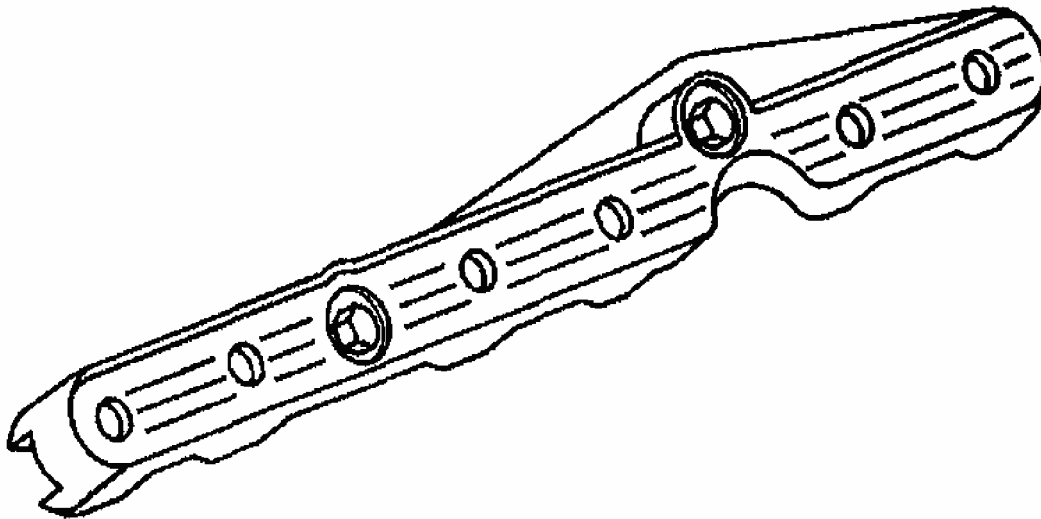
1. Mark, sort, and organize the components for assembly.
2. Clean the components in cleaning solvent.
3. Dry the components with compressed air.



G02502924

Fig. 183: Valve Lifters & Guides
Courtesy of GENERAL MOTORS CORP.

4. Inspect the valve lifter pushrod guides for excessive wear.
5. Inspect the valve lifter pushrod guides for cracks or damage.



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Fig. 184: Valve Lifter Pushrod Guides
Courtesy of GENERAL MOTORS CORP.

6. Inspect the valve lifter for the following:
- Broken or damaged clip (1)
 - Worn pushrod socket (2)
 - Scuffed or worn lifter body (3)
 - If the valve lifter shows scuffing or wear, inspect the engine block valve lifter bores for wear.
 - Worn roller (4)
 - Loose or damaged pin (5)
 - Plugged oil hole (6)

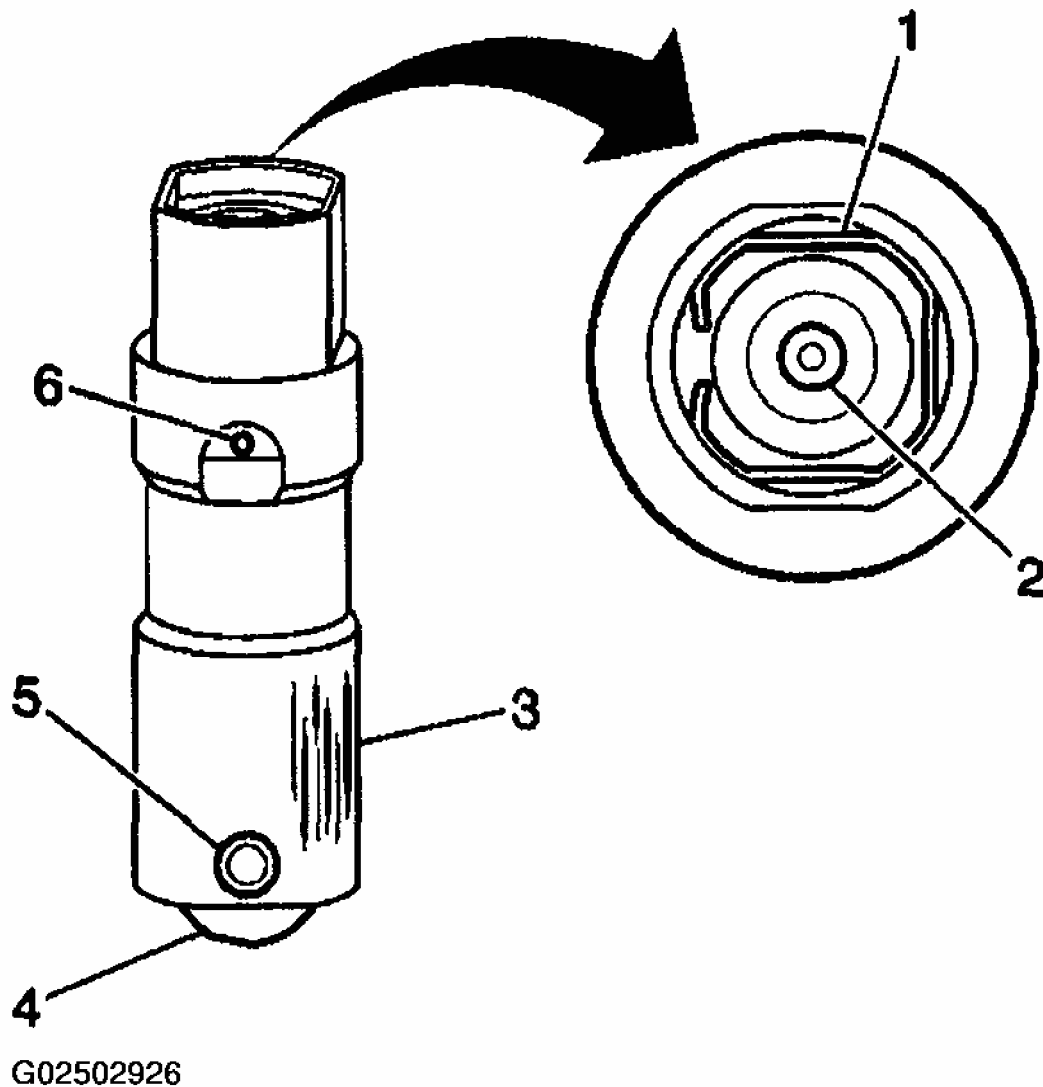


Fig. 185: Inspecting Valve Lifter
Courtesy of GENERAL MOTORS CORP.

CYLINDER HEAD DISASSEMBLE

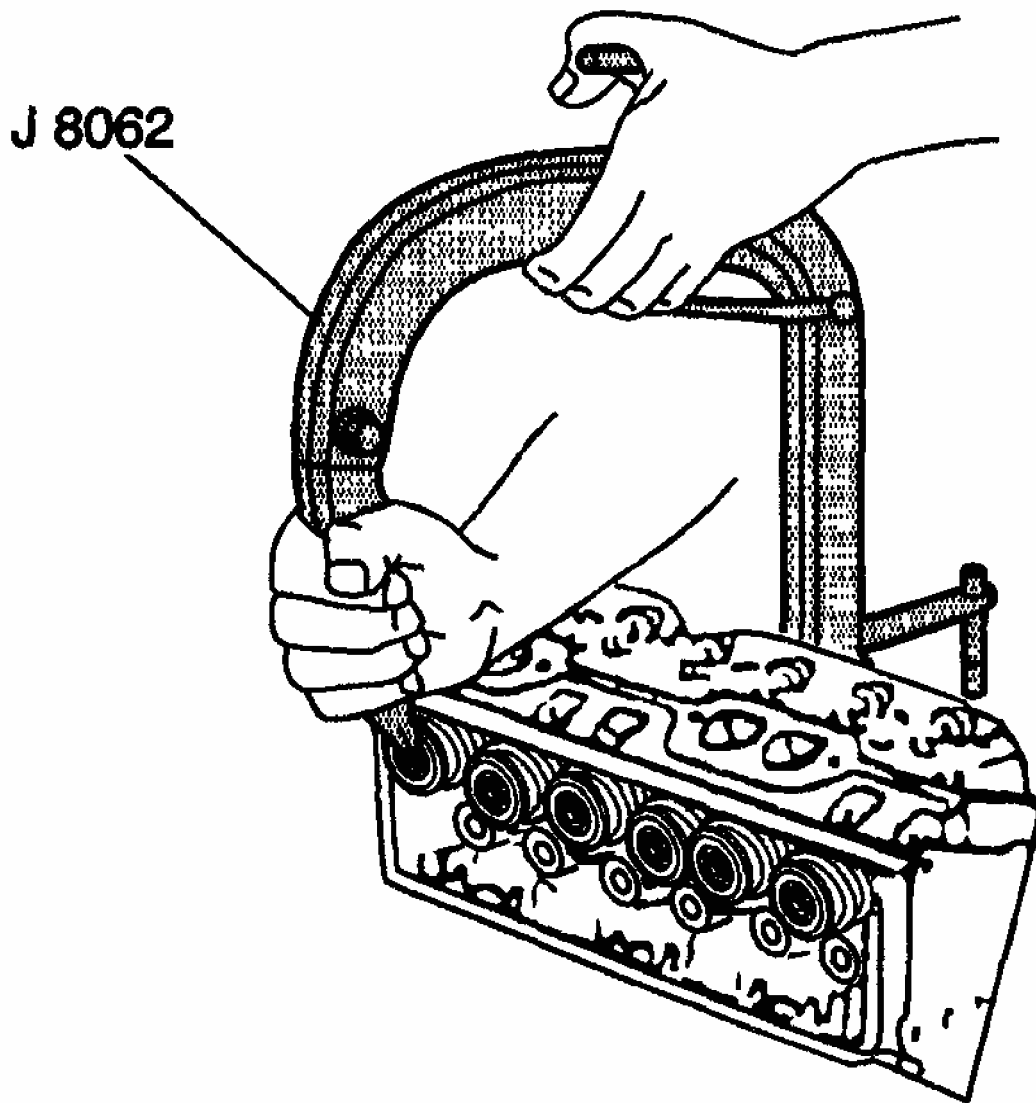
Tools Required

J 8062 Valve Spring Compressor

CAUTION: Compressed valve springs have high tension against the valve spring compressor. Valve springs that are not properly compressed by or released from the valve spring compressor can be ejected from the valve spring

compressor with Intense force. Use care when compressing or releasing the valve spring with the valve spring compressor and when removing or installing the valve stem keys. Falling to use care may cause personal injury.

1. Use the **J 8062** in order to compress the valve springs.



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Fig. 186: Compressing Valve Springs
Courtesy of GENERAL MOTORS CORP.

Important: Mark, sort, and organize the components so that the components can be

reinstalled in their original location and position.

2. Remove the valve stem keys (1).
3. Remove the **J 8062** from the cylinder head.
4. Remove the valve spring cap (2).
5. Remove the valve spring (3).
6. Remove the valve stem oil seal (4).
7. Discard the valve stem oil seal.
8. Remove the valve.

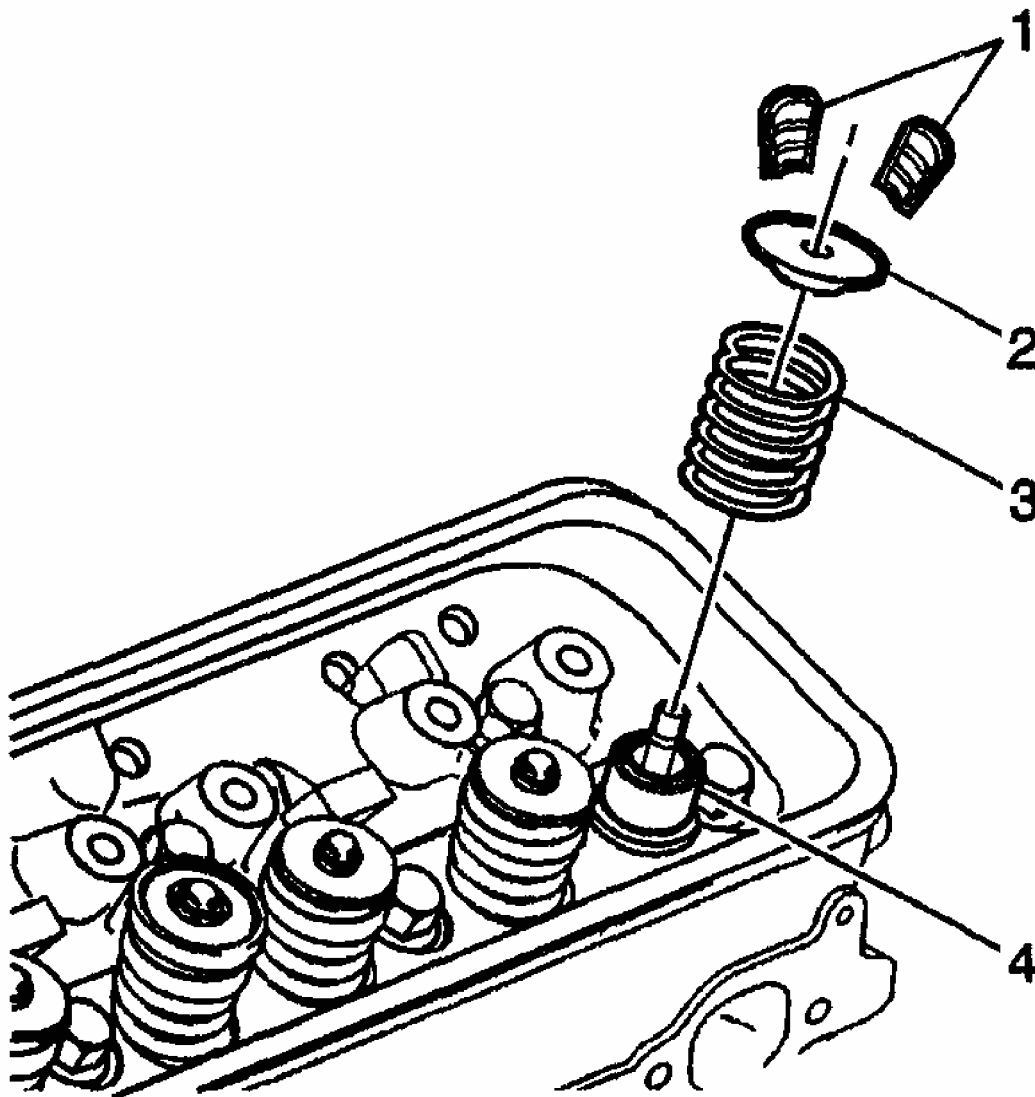
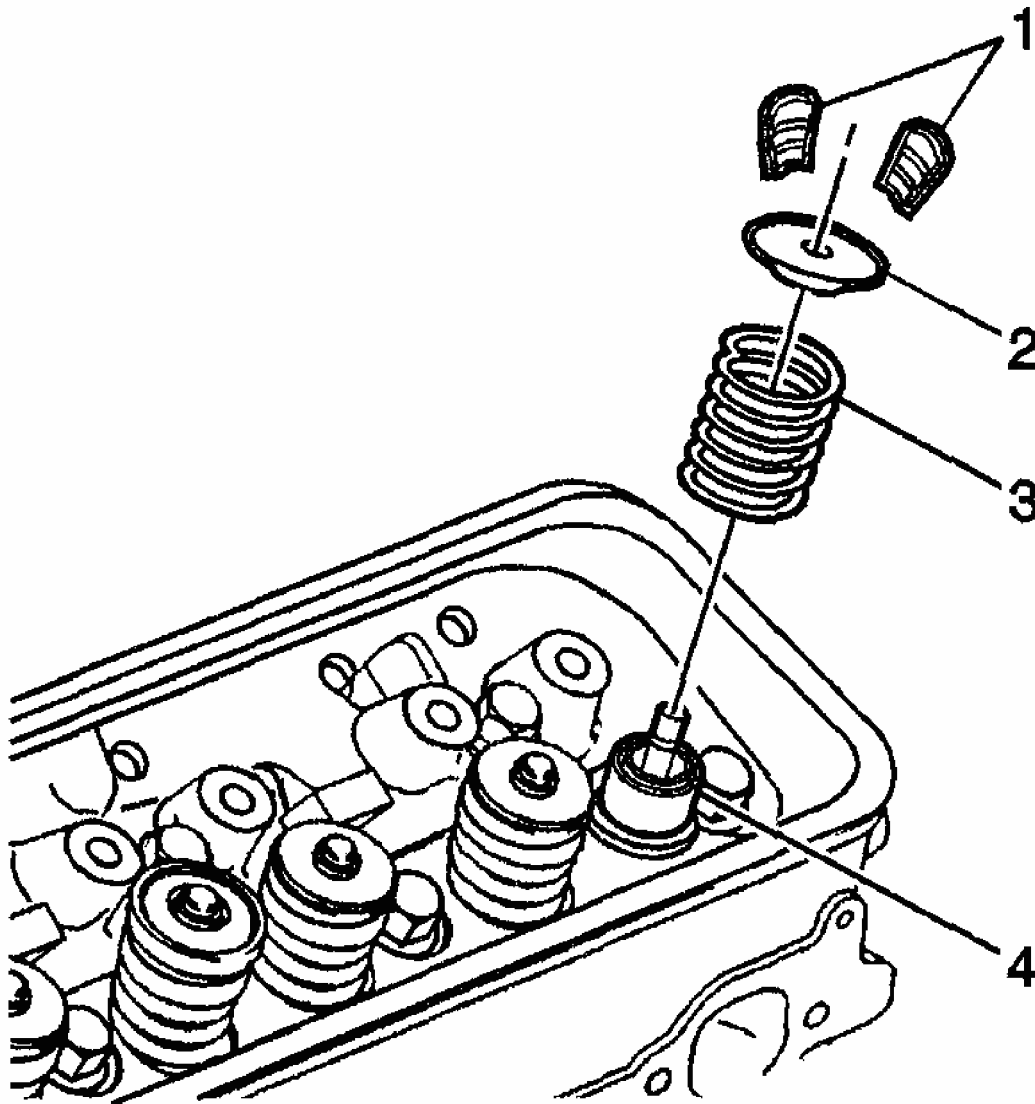


Fig. 187: Valve Spring, Valve Spring Cap & Valve Stem Oil Seal
Courtesy of GENERAL MOTORS CORP.

CYLINDER HEAD CLEANING & INSPECTION

Tools Required

- **J 8001** Dial Indicator Set
 - **J 8089** Carbon Removing Brush
 - **J 9666** Valve Spring Tester
1. Clean the valve stems and cylinder heads on a buffing wheel.
 2. Clean the following components in cleaning solvent:
 - Valve stem keys (1)
 - Valve spring cap (2)
 - Valve spring (3)
 - Cylinder head



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Fig. 188: Valve Spring, Valve Spring Cap & Valve Stem Oil Seal
Courtesy of GENERAL MOTORS CORP.

3. Dry the components with compressed air.
4. Use the **J 8089** to clean the carbon from the cylinder head combustion chambers.

Be careful not to scuff the combustion chambers.

5. Inspect the cylinder head for the following:
 - Damage to the gasket surfaces
 - Damage to the threaded bolt holes

- Burnt or eroded areas in the combustion chamber
- Cracks in the exhaust ports and combustion chambers
- External cracks in the water chamber
- Restrictions in the intake or exhaust passages
- Restrictions in the cooling system passages
- Rusted, damaged, or leaking core plugs

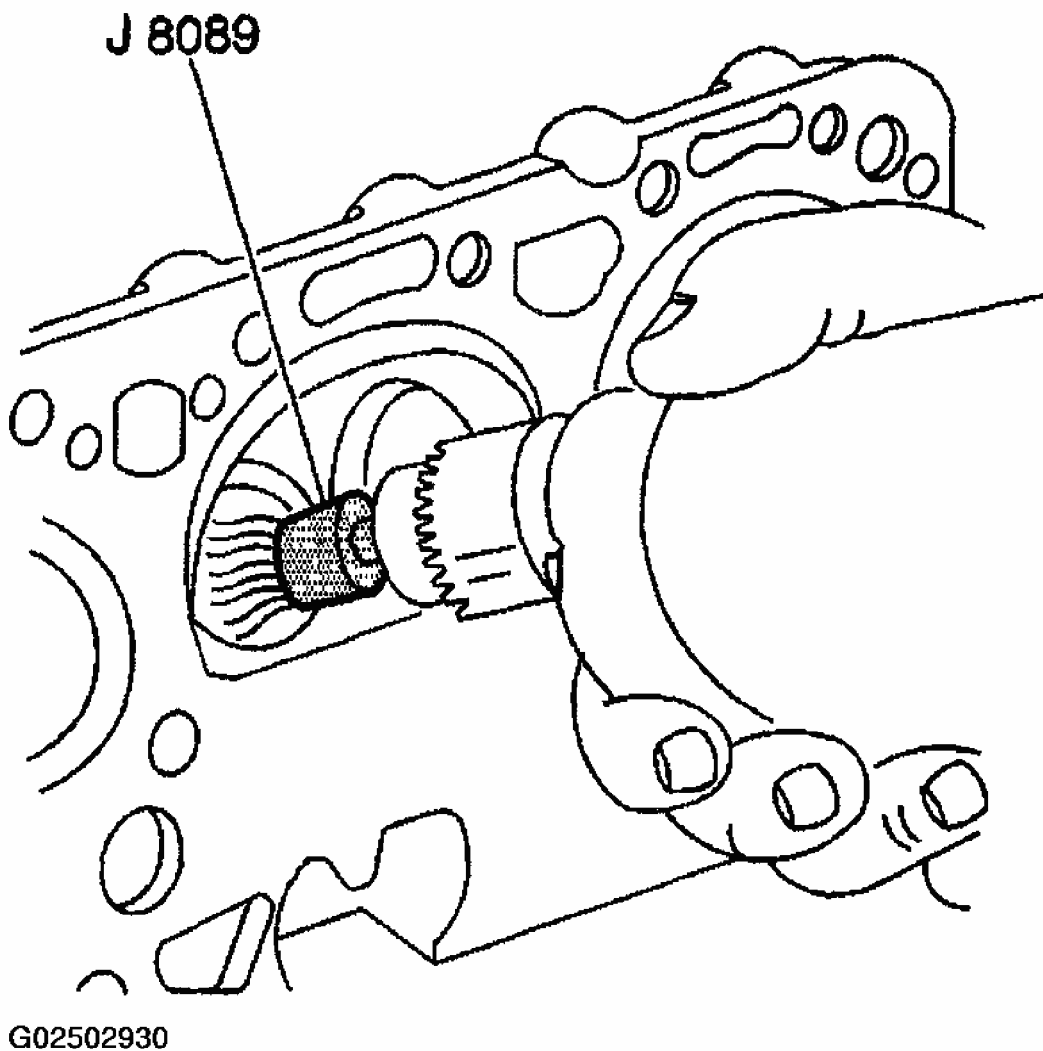
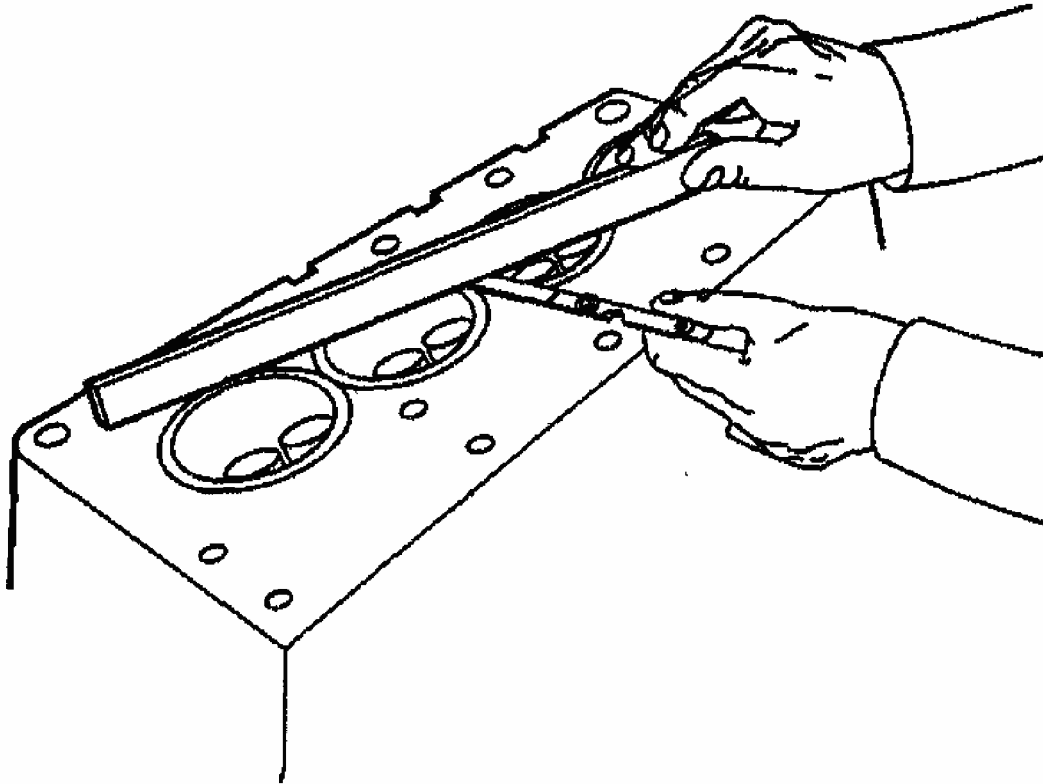


Fig. 189: Cleaning Carbon From Cylinder Head Combustion Chambers
Courtesy of GENERAL MOTORS CORP.

6. Measure the cylinder head for warpage with a straight edge and feeler gage.
 - A cylinder head block deck with warpage in excess of 0.10 mm (0.004 in) within a 152.4 mm (6.0 in) area must be repaired or replaced.

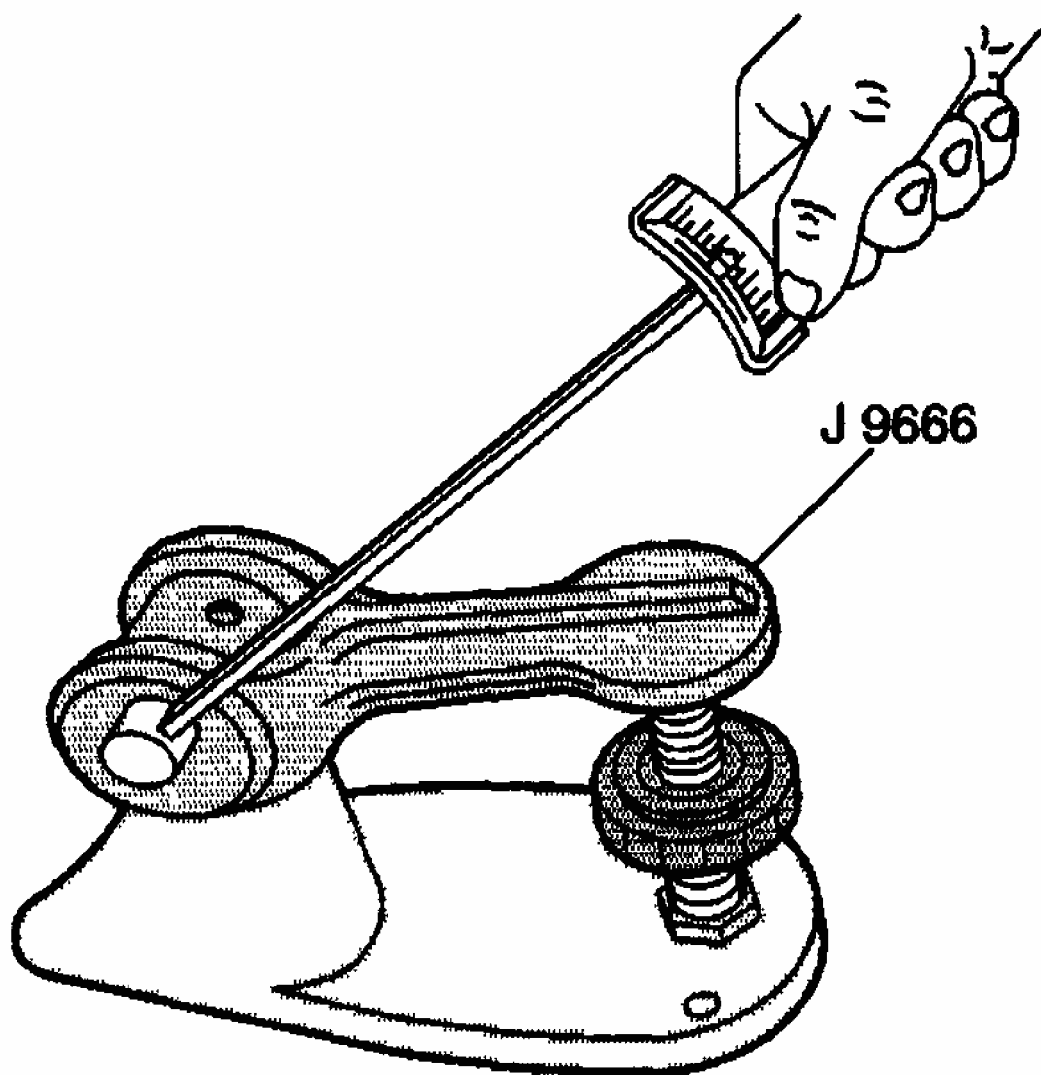
- A cylinder head exhaust manifold deck with warpage in excess of 0.05 mm (0.002 in) within a 152.4 mm (6.0 in) area must be repaired or replaced.
- A cylinder head intake manifold deck with warpage in excess of 0.10 mm (0.004 in) within a 152.4 mm (6.0 in) area must be repaired or replaced.



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Fig. 190: Measuring Cylinder Head For Warpage
Courtesy of GENERAL MOTORS CORP.

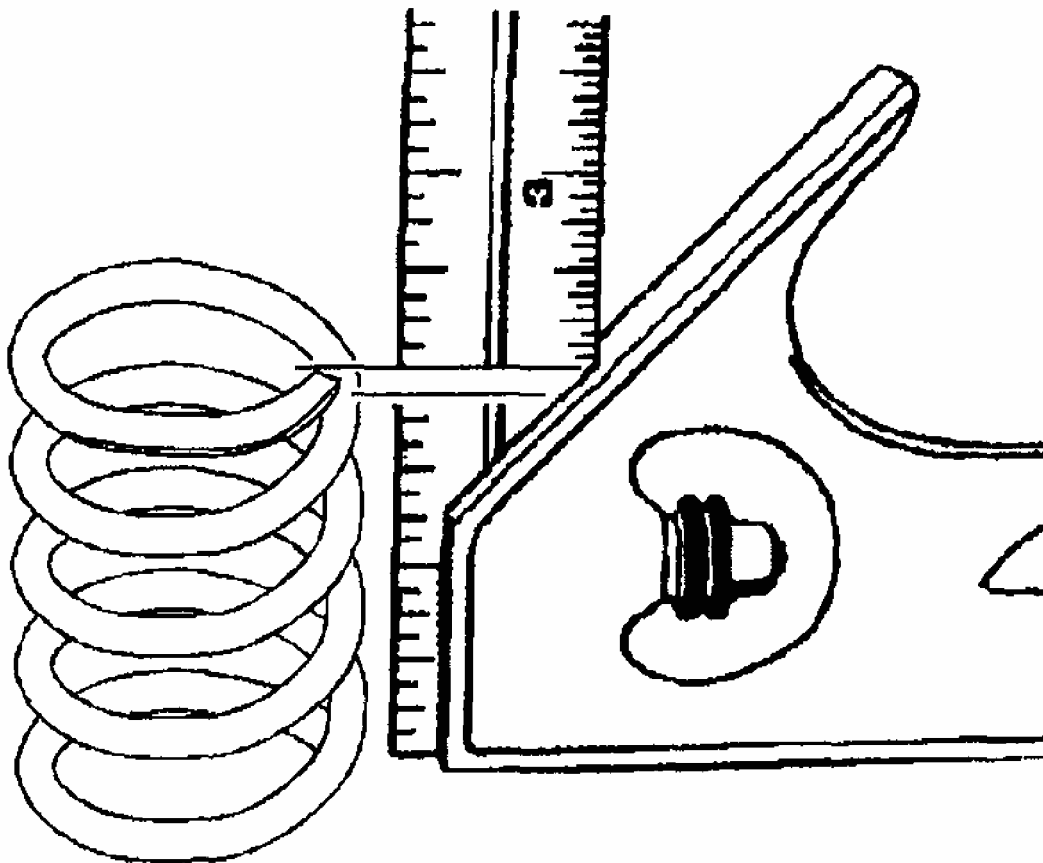
7. Use the **J 9666** in order to measure the valve spring. Replace the valve spring if the valve spring tension is less than 338 N (76 Lb) at 43.2 mm (1.70 in).



G02502932

Fig. 191: Measuring Valve Spring
Courtesy of GENERAL MOTORS CORP.

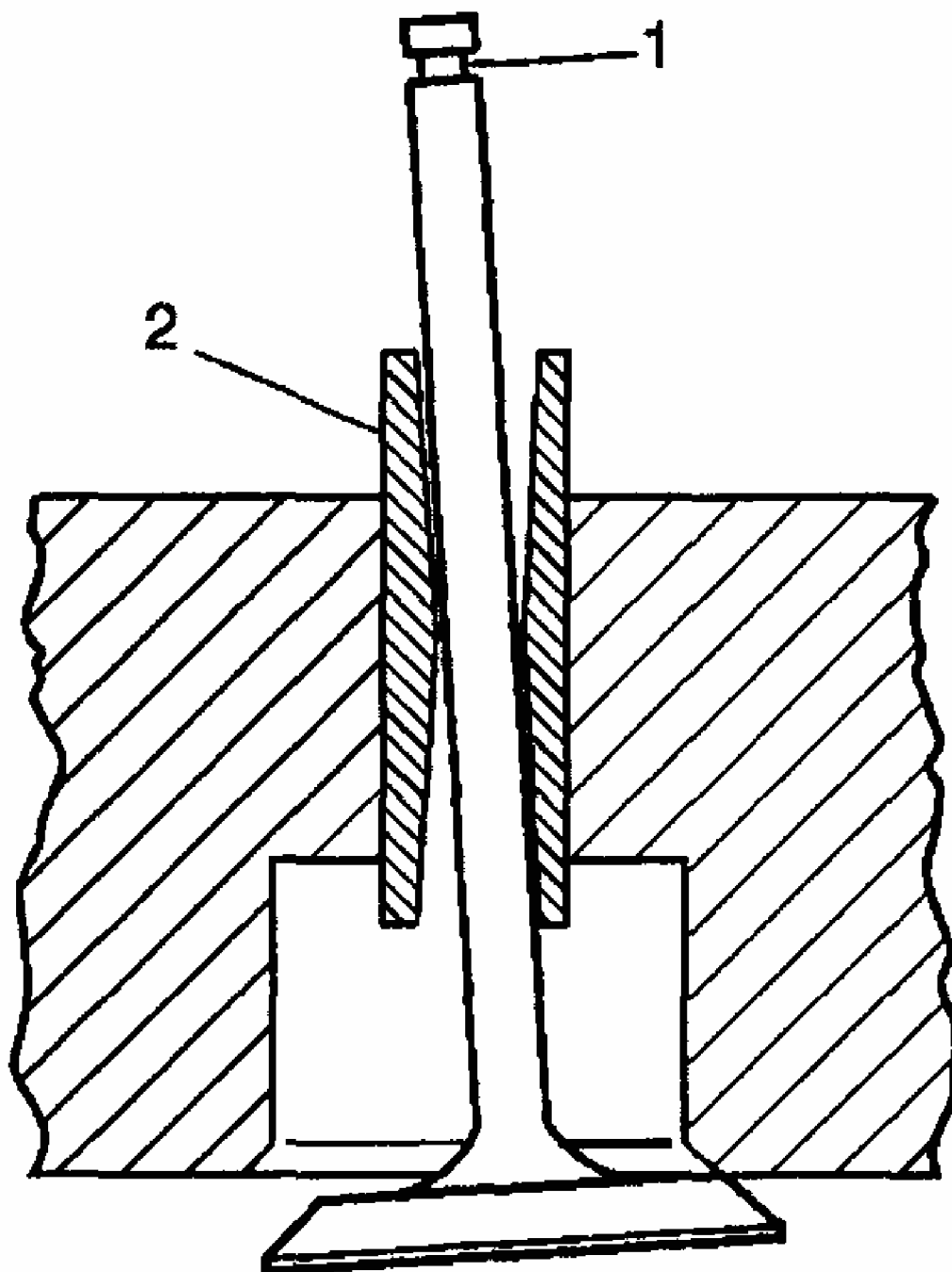
8. Inspect the valve springs for squareness.



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Fig. 192: Inspecting Valve Springs For Squareness
Courtesy of GENERAL MOTORS CORP.

9. Valve stems (1) with excessive valve guide (2) clearance must be repaired or the cylinder head replaced.



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Fig. 193: Checking Valve Stems For Excessive Valve Guide Clearance
Courtesy of GENERAL MOTORS CORP.

10. Measure the valve stem-to-guide clearance. Excessive valve stem-to-guide clearance

may cause an excessive oil consumption and may also cause a valve to break. Insufficient clearance will result in noisy and sticky functioning of the valve and will disturb the engine assembly smoothness.

10.1. Clamp the **J 8001** on the exhaust port side of the cylinder head.

10.2. Position the dial indicator so that the movement of the valve stem from side to side, crosswise to the cylinder head, will cause a direct movement of the dial indicator stem. The dial indicator stem must contact the side of the valve stem just above the valve guide.

10.3. Drop the valve head about 1.6 mm (0.063 in) off the valve seat.

10.4. Use light pressure and move the valve stem from side to side in order to obtain a valve stem-to-guide clearance reading. Refer to **Engine Mechanical Specifications** .

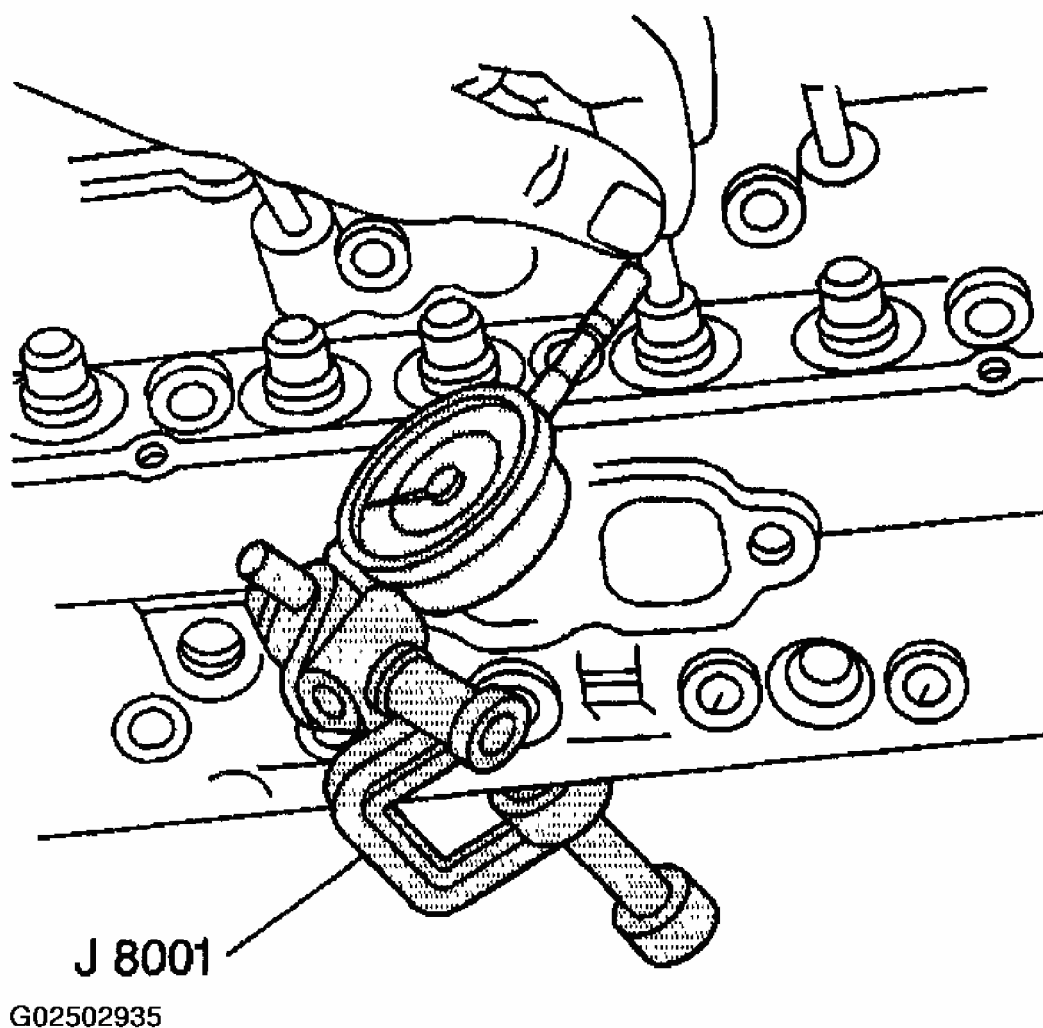


Fig. 194: Measuring Valve Stem-To-Guide Clearance

2001 Chevrolet S10 Pickup
2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

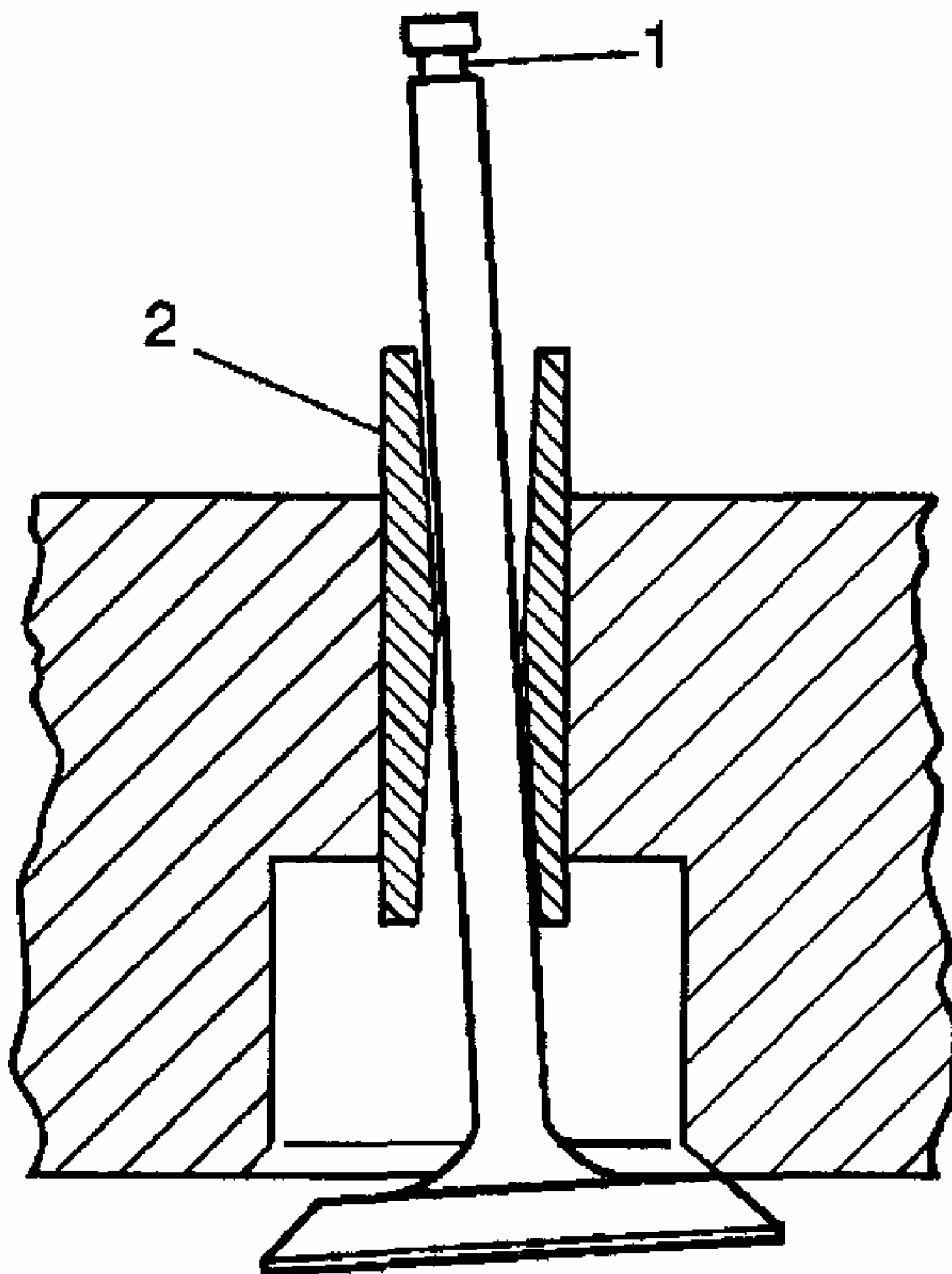
Courtesy of GENERAL MOTORS CORP.

VALVE GUIDE REAMING/VALVE & SEAT GRINDING

Tools Required

J 5830-02 Valve Guide Reamer Set

1. Measure the valve stem-to-guide clearance. Refer to **Cylinder Head Cleaning & Inspection** .
2. Improper valve stem (1) to valve guide (2) clearance may cause excessive oil consumption.



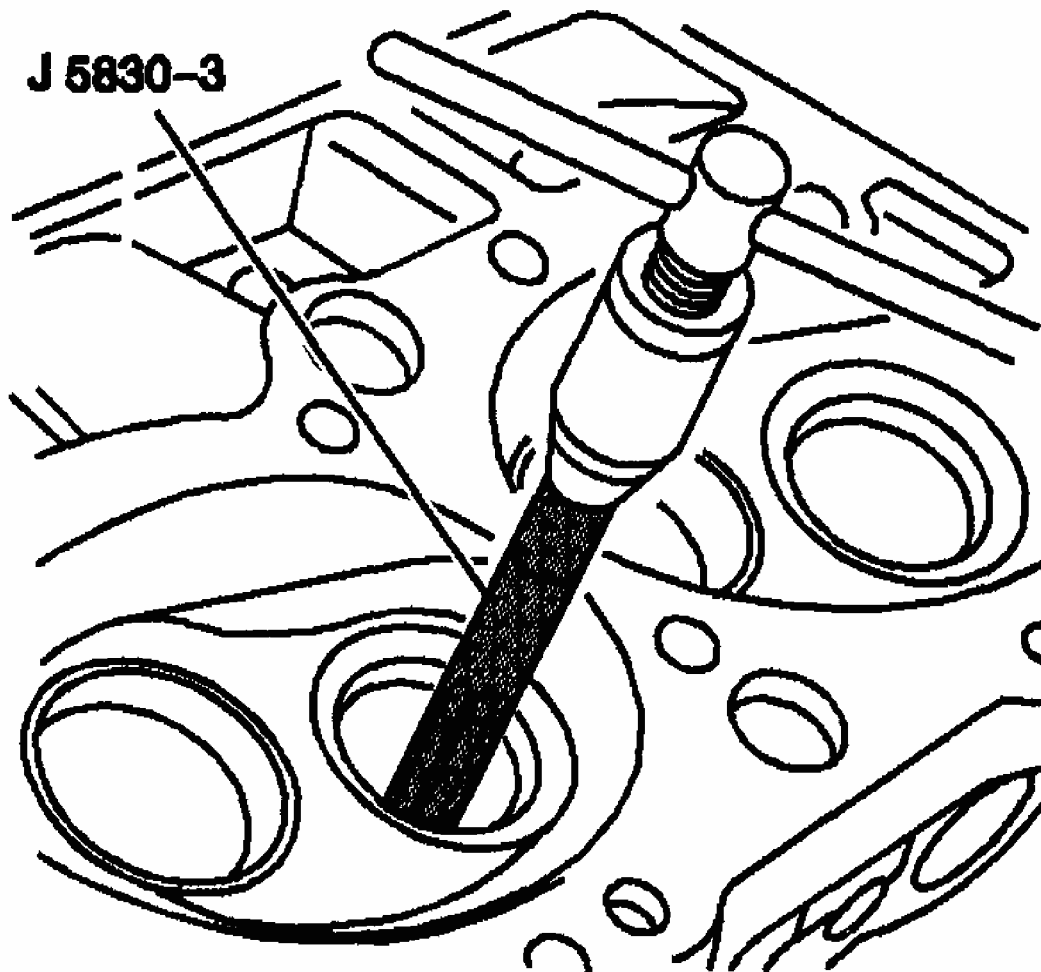
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Fig. 195: Improper Valve Stem To Valve Guide Clearance
Courtesy of GENERAL MOTORS CORP.

Important: Exhaust valves with excessive valve stem-to-guide clearance must be

replaced with the available service valve that has an 0.774 mm (0.0305 in) oversize valve stem. The intake valves are NOT available with oversize valve stems. Replace the cylinder head if after using a NEW intake valve in order to measure the valve stem-to-guide clearance, the valve stem-to-guide clearance is not within specifications.

3. Use the J 5830-3 in order to ream the exhaust valve guide in order to achieve the correct valve stem-to-guide clearance.

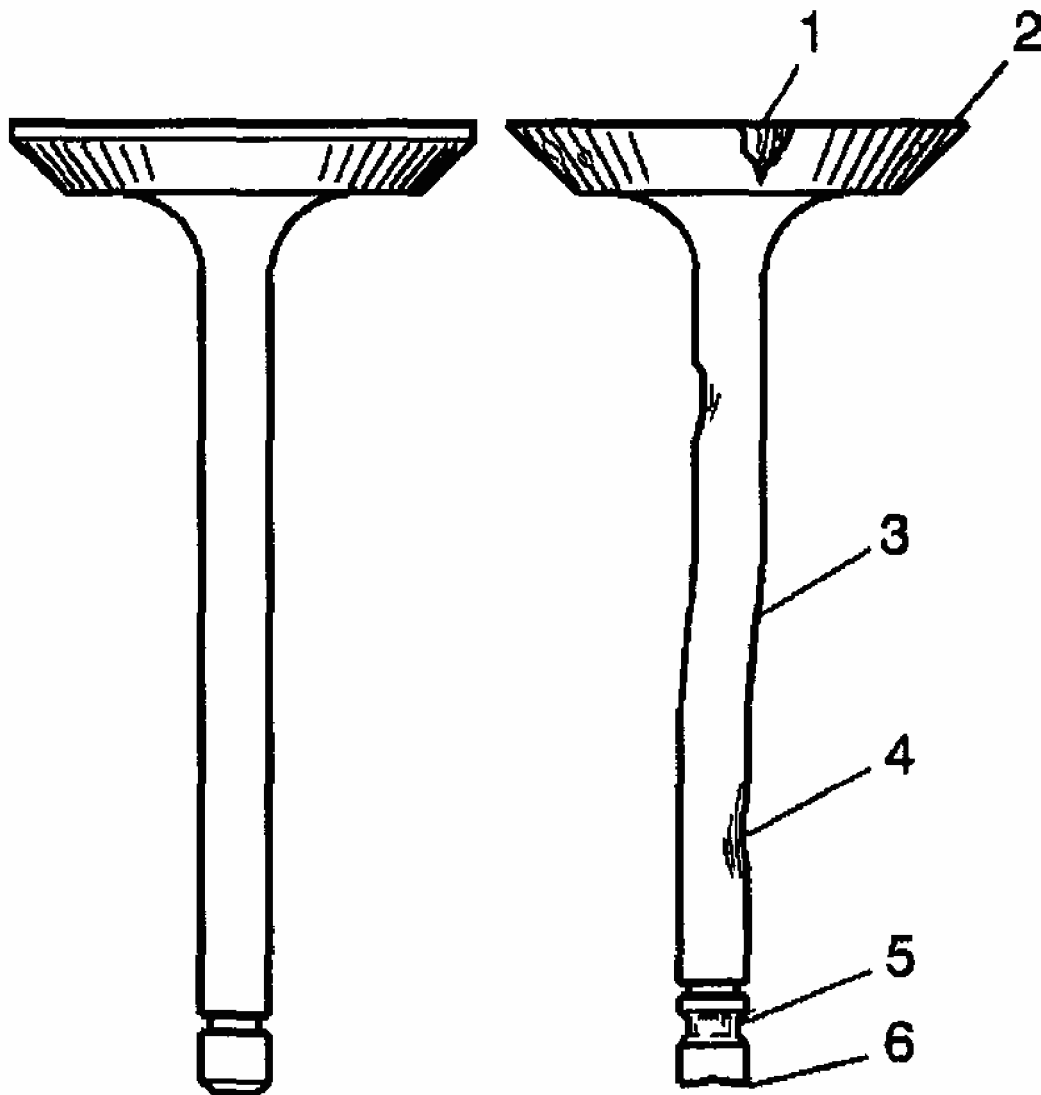


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Fig. 196: Reaming Exhaust Valve Guide
Courtesy of GENERAL MOTORS CORP.

4. Always recondition the exhaust valve seat after reaming the exhaust valve guide bores and installing new exhaust valves.
5. Inspect the valves for the following:
 - Burnt or damaged areas (1)

- Undersized margin (2)
- Bent stem (3)
- Scoring or other damage to the stem (4)
- Worn key groove (5)
- Worn stem tip (6)



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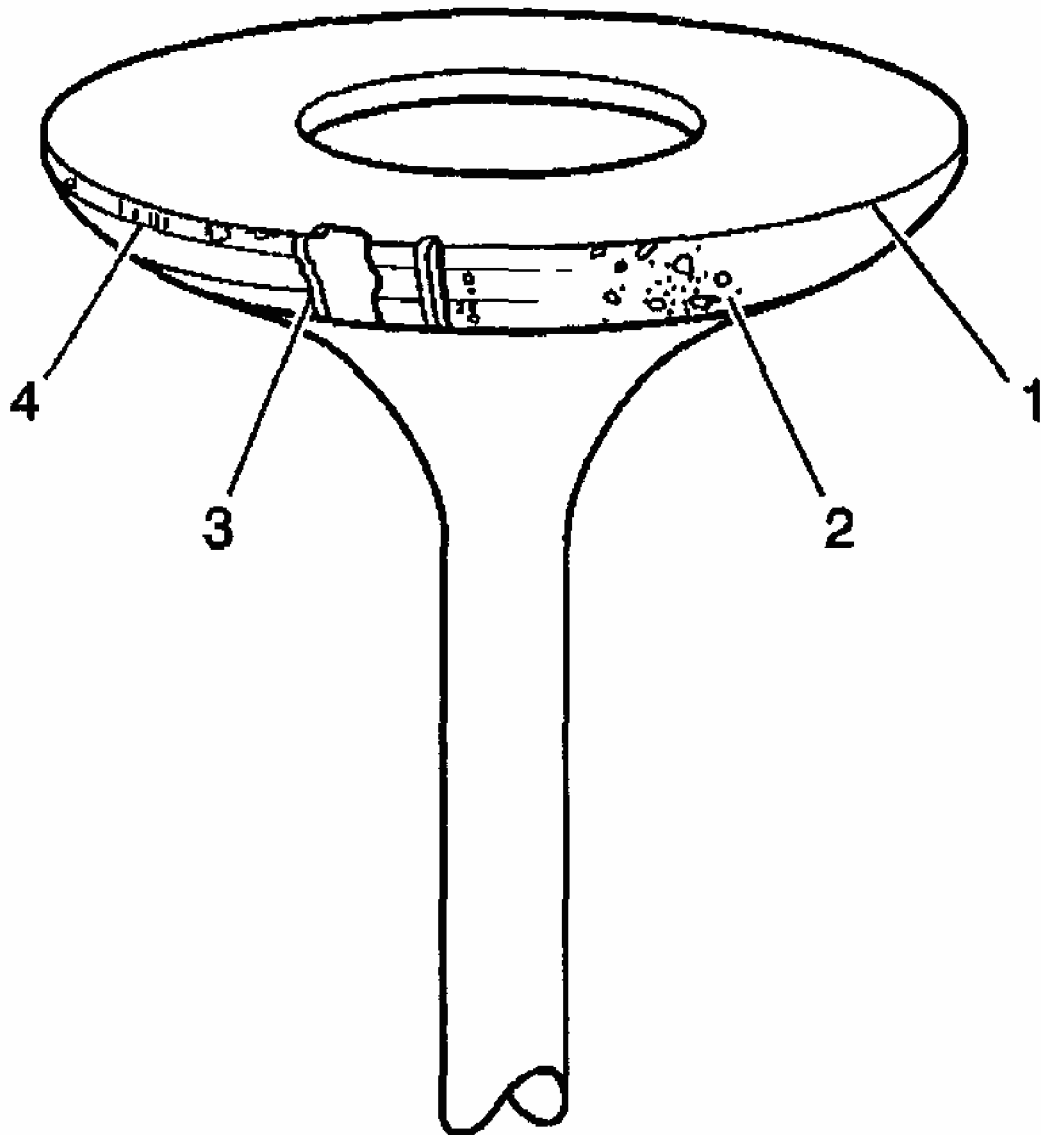
Fig. 197: Inspecting Valves For Damage Or Wear
Courtesy of GENERAL MOTORS CORP.

6. Inspect the valve contact surface for the following:

- Undersized margin (1)
- Pitted surface (2)
- Burnt or eroded areas (3)
- Acceptable edge margin (4)

Valves with excessive damage must be replaced.

Minor imperfections of the valve or valve seat may be repaired.



G02502939

Fig. 198: Inspecting Valve Contact Surface For Damage Or Wear

Courtesy of GENERAL MOTORS CORP.**7. Reconditioning of the valves and valve seats:**

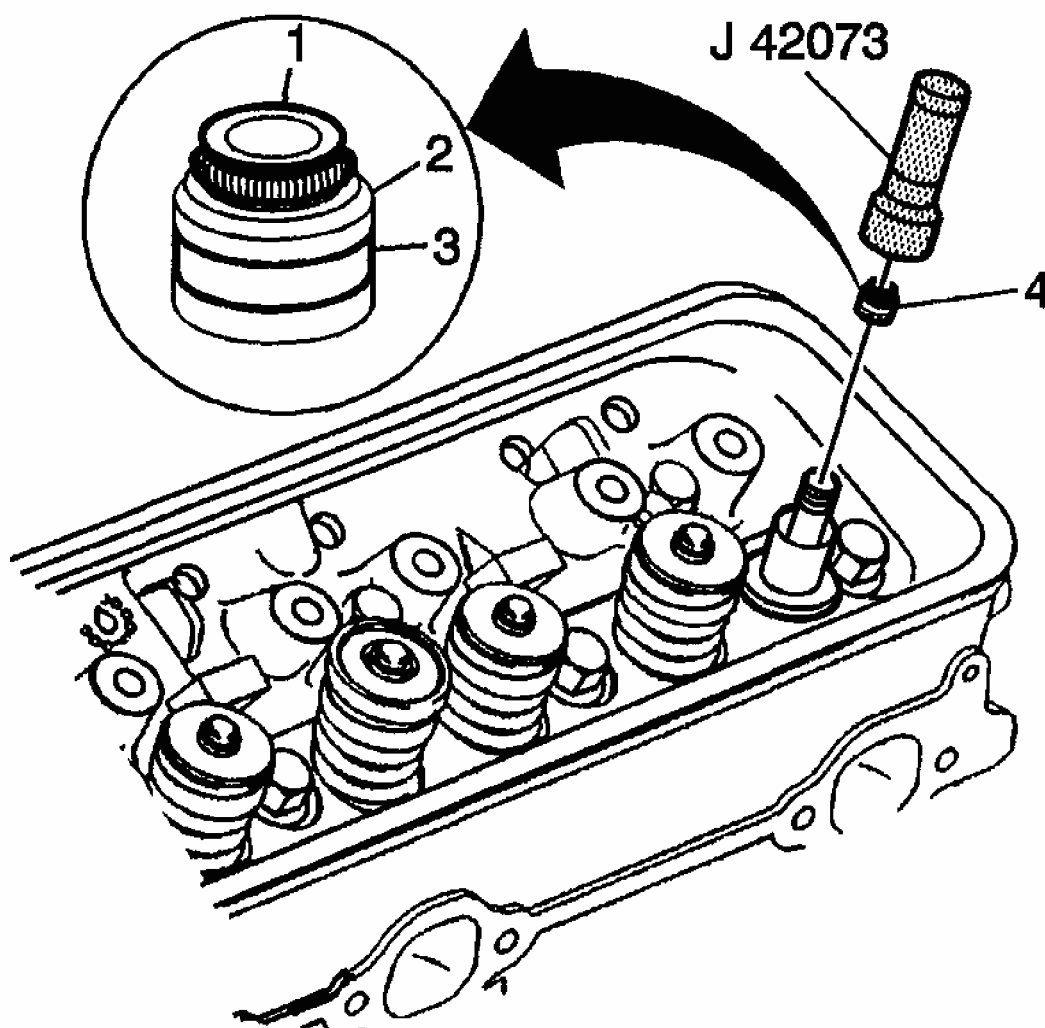
- The valves must seat perfectly for the engine to deliver optimum power and performance.
- Cooling the valve heads is another important factor. Good contact between each valve and valve seat in the cylinder head is necessary to insure that the heat in the valve head is properly carried away.
- Regardless of what type of equipment is used, it is essential that the valve guide bores are free from carbon or dirt in order to ensure the proper centering of the pilot in the valve guide.
- The valve seats should be concentric to within 0.05 mm (0.002 in) total indicator reading.
- Reface pitted valves on a valve refacing machine in order to ensure the correct relationship between the valve head and the valve stem.
- Replace the valve if the valve stem is excessively worn or warped.
- Replace the valve if the edge margin (4) of the valve head is less than 0.79 mm (0.031 in) thick after grinding.
- Several different types of equipment are available for reconditioning valves and valve seats. Follow the equipment manufacturer's recommendations for equipment use to attain the proper results.

CYLINDER HEAD ASSEMBLE**Tools Required**

- **J 8062** Valve Spring Compressor
- **J 42073** Valve Stem Seal Installer

Important: The exhaust valve oil stem seal has the letters EX (1) molded into the top of the seal. The exhaust valve oil stem seal material is brown in color (2) with a white stripe (3) painted onto the outside diameter of the seal, or the material may be red in color (2) with no paint stripe. The intake valve oil seal is black in color.

1. Assemble the valve into the proper valve guide.
2. Select the proper valve stem oil seal for the specific valve guide.
3. Lubricate the valve stem oil seal and the outside diameter of the valve guide with clean engine oil.
4. Assemble the valve stem oil seal onto the valve stem.

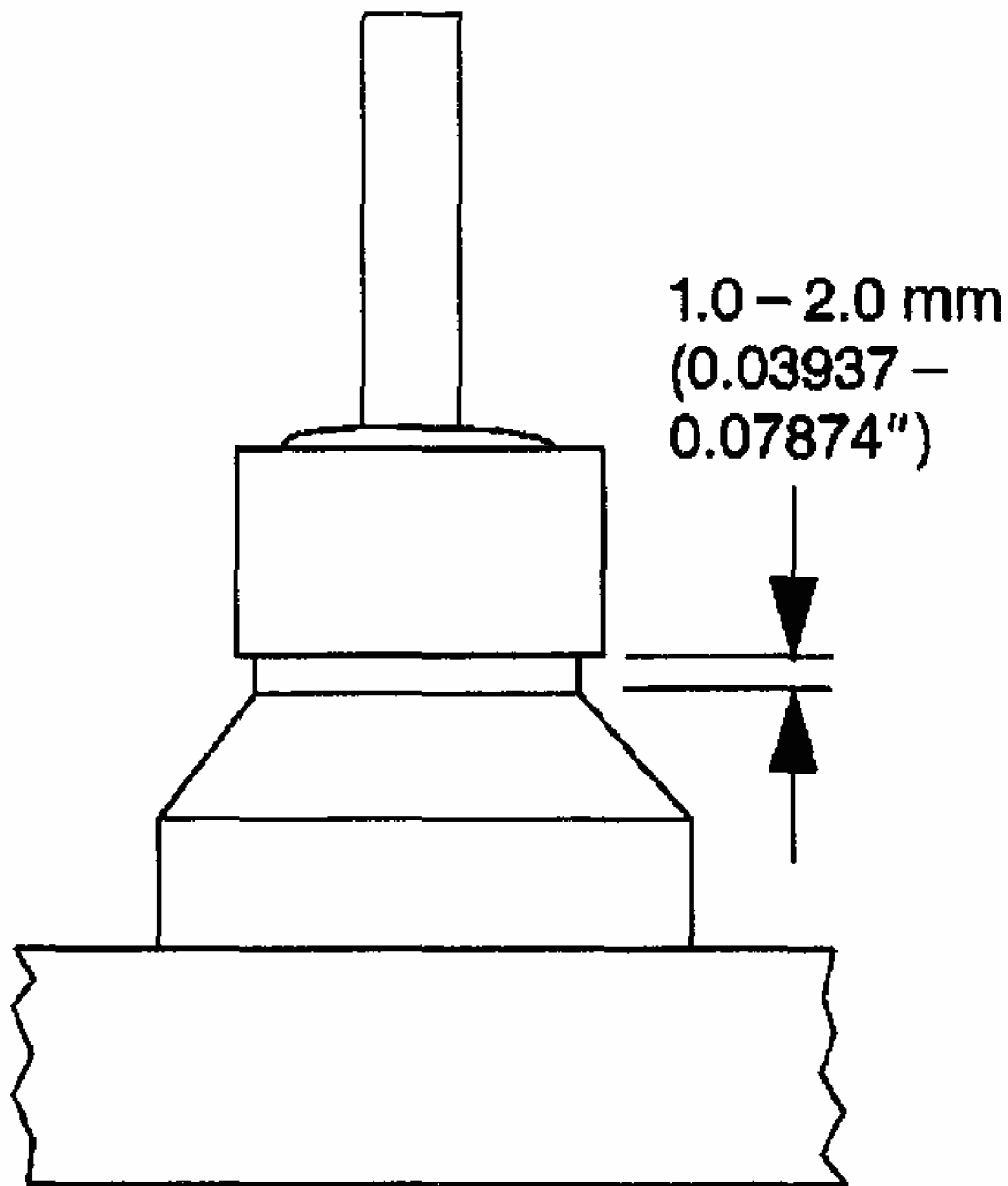


G02502940

Fig. 199: Installing Valve Stem Oil Seal Onto Valve Guide
Courtesy of GENERAL MOTORS CORP.

5. Using the **J 42073** , install the valve stem oil seal onto the valve guide.
 - 5.1. Tap the valve stem oil seal onto the valve guide until the **J 42073** bottoms against the valve spring seat.
 - 5.2. Inspect the valve stem oil seal. The valve stem oil seal should not be bottomed against the valve guide.

There should be a 1-2 mm (0.03937-0.07874 in) gap between the bottom edge of the valve stem oil seal and the valve guide.

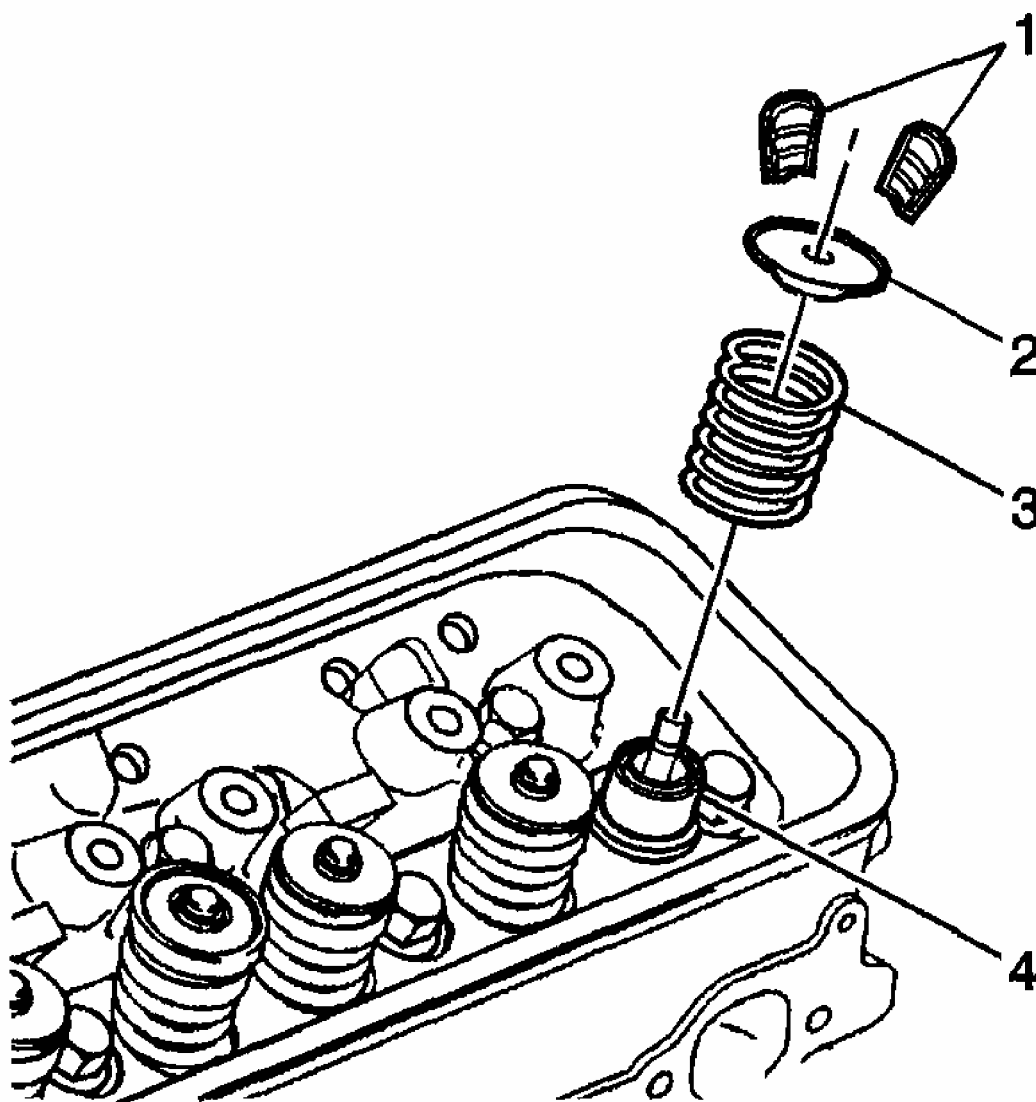


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Fig. 200: Checking Gap Between Bottom Edge Of Valve Stem Oil Seal & Valve Guide

Courtesy of GENERAL MOTORS CORP.

6. Install the valve spring (3).
7. Install the valve spring cap (2) onto the valve spring (3), over the valve stem.



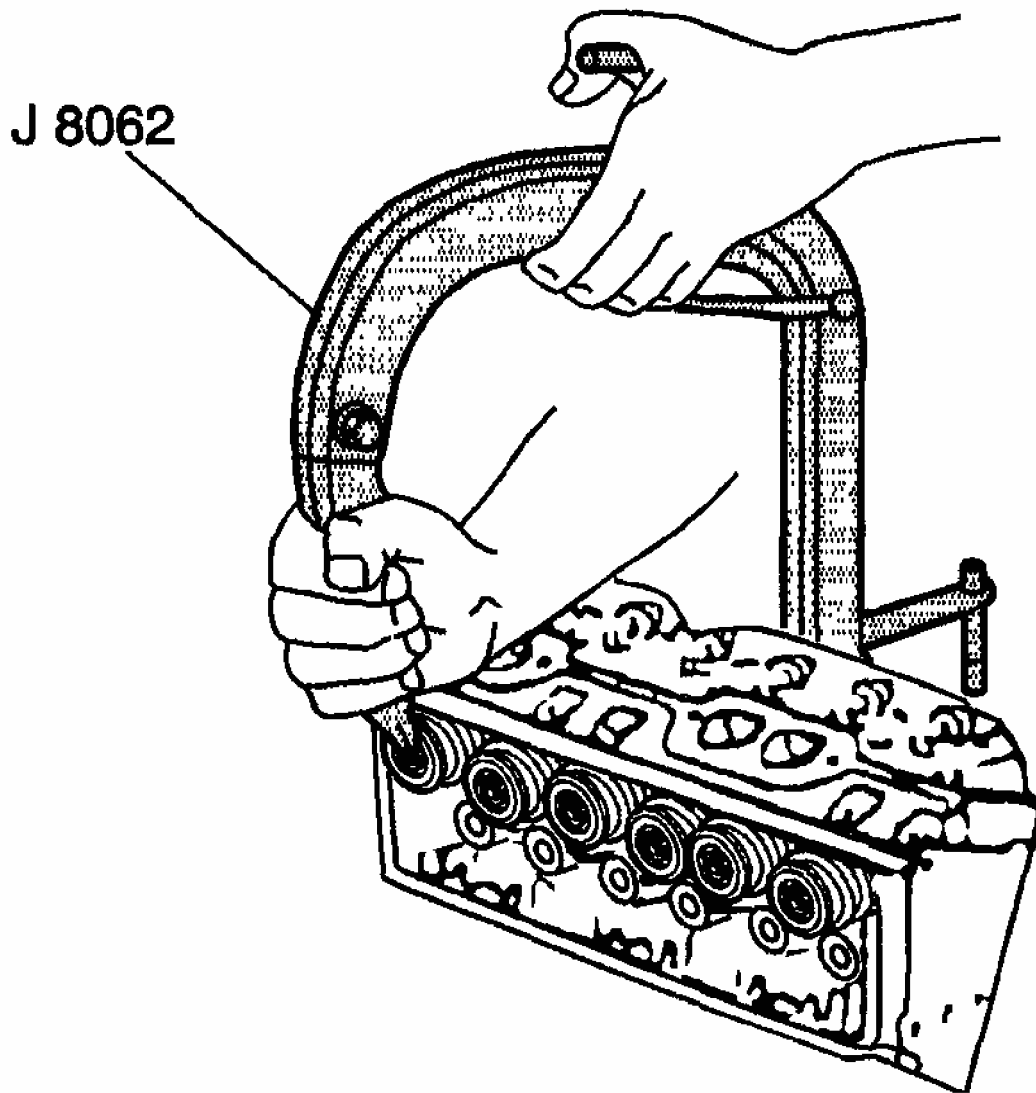
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Fig. 201: Installing Valve Spring Cap Onto The Valve Spring Over Valve Stem
Courtesy of GENERAL MOTORS CORP.

CAUTION: Compressed valve springs have high tension against the valve spring compressor. Valve springs that are not properly compressed by or released from the valve spring compressor can be ejected from the valve spring compressor with intense force. Use care when compressing or releasing the valve spring with the valve spring compressor and when removing or installing the valve stem keys. Falling to use care may

cause personal injury.

8. Use the **J 8062** to compress the valve spring.



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Fig. 202: Compressing Valve Spring
Courtesy of GENERAL MOTORS CORP.

9. Install the valve stem O-ring seal.
10. Install the valve stem keys.
 - 10.1. Use grease to hold the valve stem keys in place while disconnecting the J 8062.

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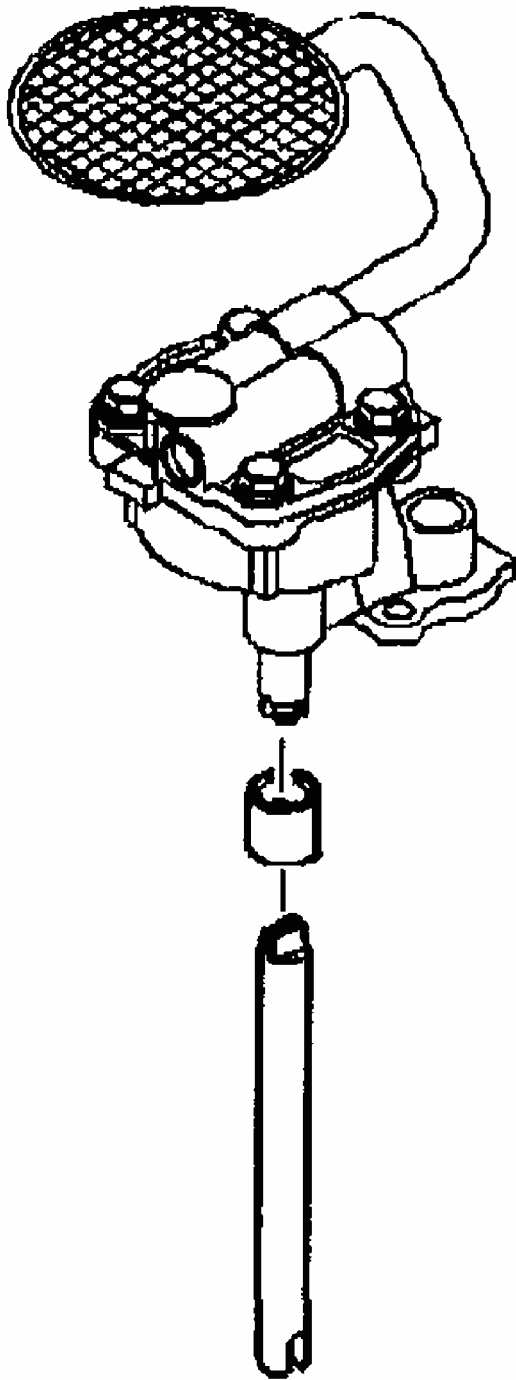
2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

10.2. Tap the end of the valve stem with a plastic-faced hammer to seat the valve stem keys.

10.3. Inspect the valve stem keys to ensure that they are seated in the upper groove of the valve stem.

OIL PUMP DISASSEMBLE

1. Remove the oil pump driveshaft and oil pump driveshaft retainer.



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Fig. 203: Oil Pump Driveshaft
Courtesy of GENERAL MOTORS CORP.

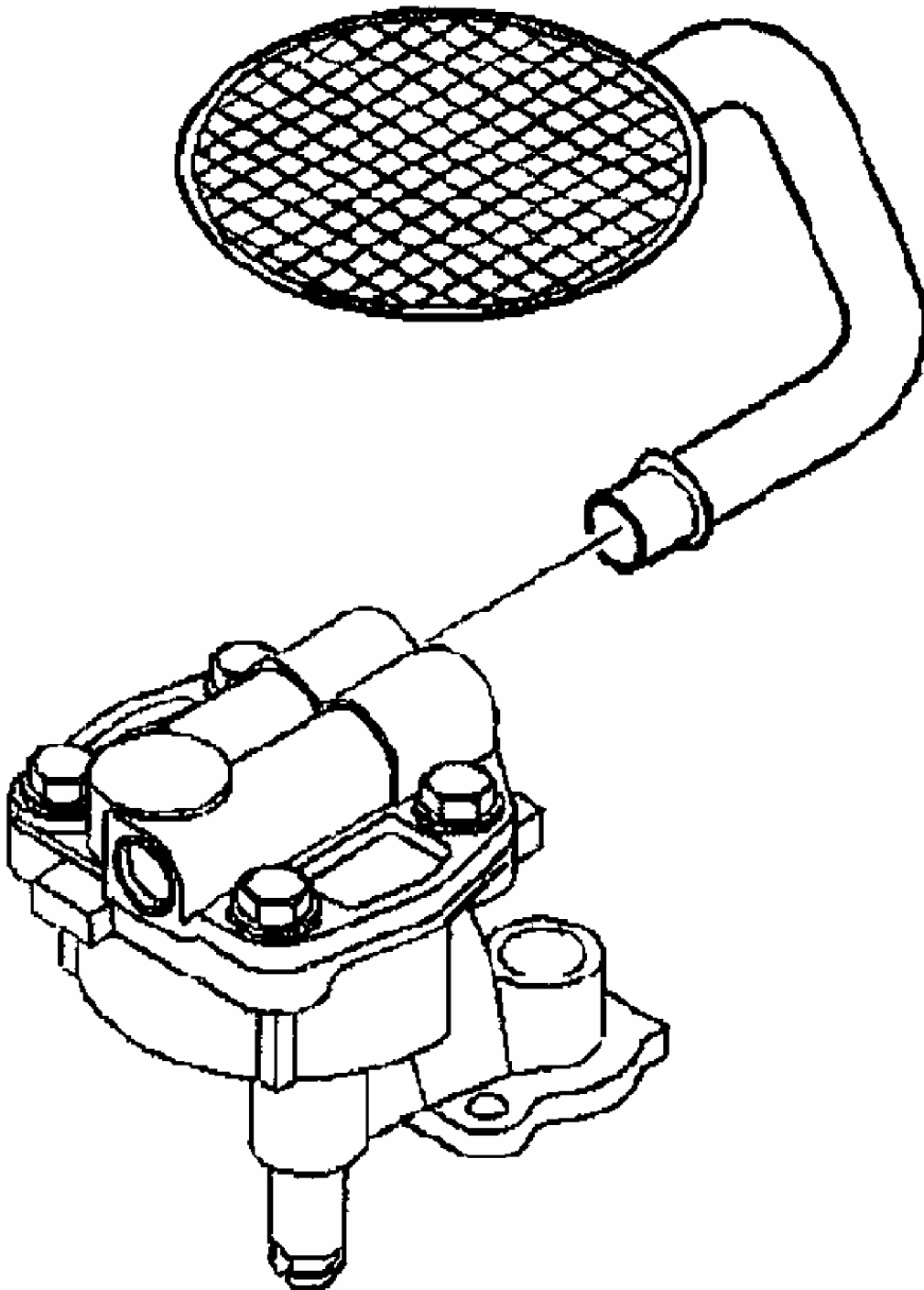
Important: Do not remove the oil pump screen from the pipe. The pipe and oil pump screen are serviced as a complete assembly.

2. Remove the oil pump screen, if necessary. The oil pump screen has a press fit into the

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

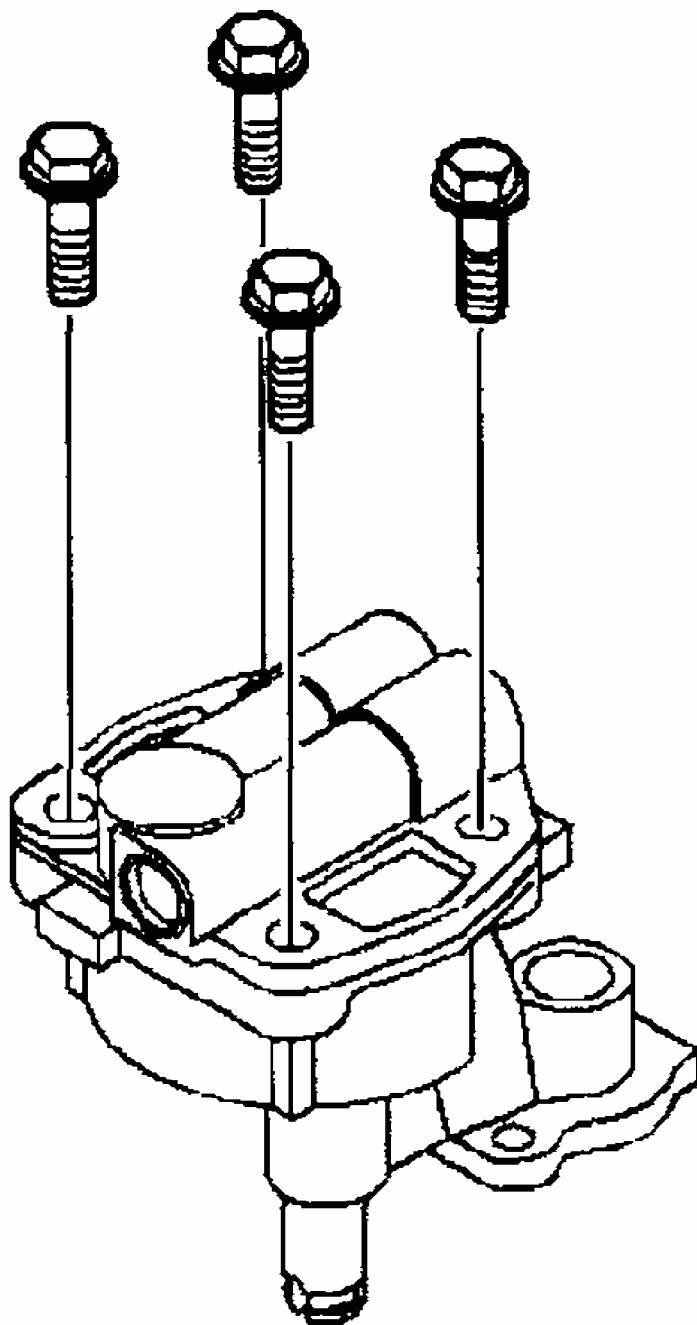
oil pump cover.



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Fig. 204: Oil Pump Screen
Courtesy of GENERAL MOTORS CORP.

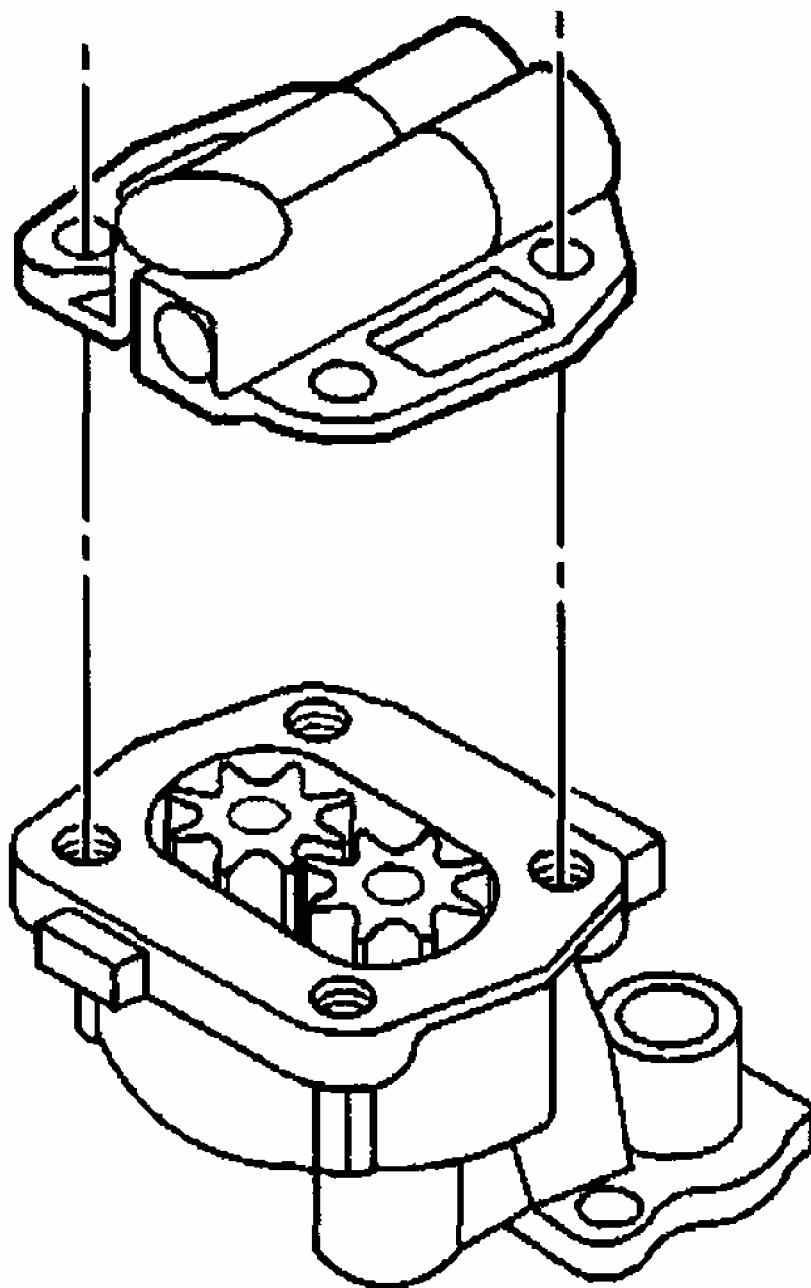
3. Remove the oil pump cover bolts.



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Fig. 205: Oil Pump Cover Bolts
Courtesy of GENERAL MOTORS CORP.

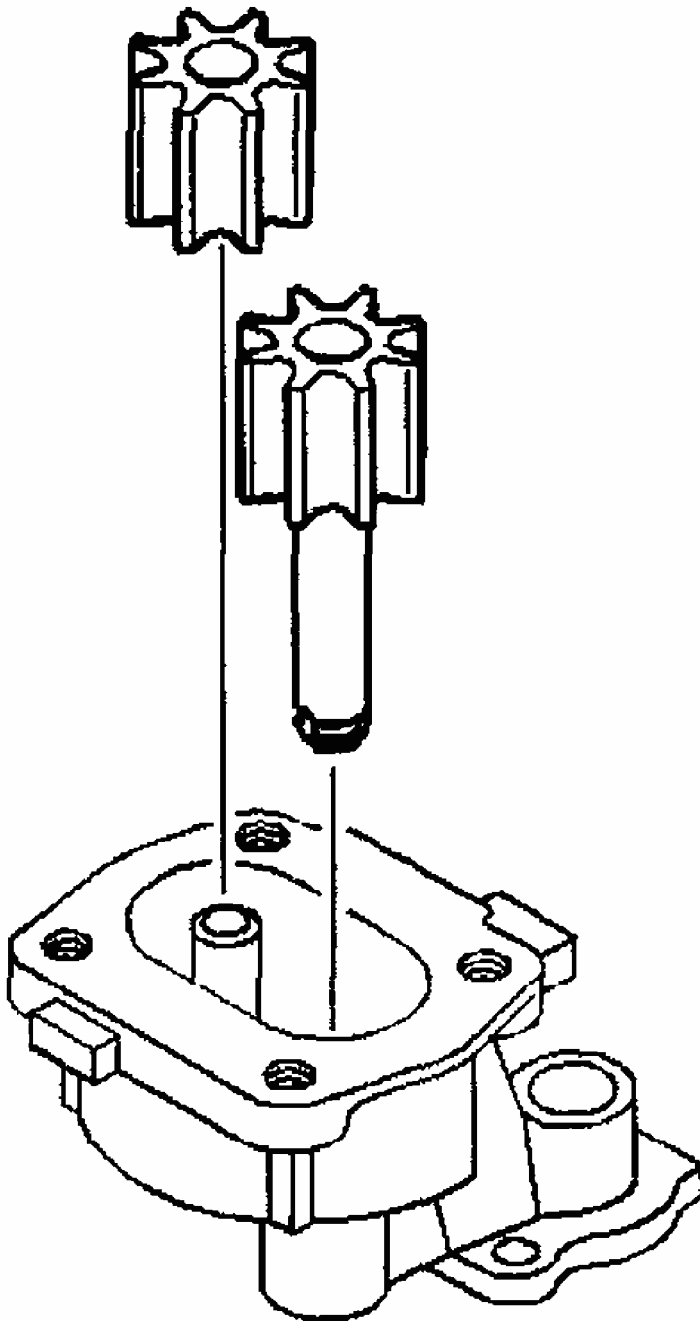
4. Remove the oil pump cover.



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Fig. 206: Oil Pump Cover
Courtesy of GENERAL MOTORS CORP.

5. Remove the oil pump drive gear and the oil pump driven gear.



G02502948

Fig. 207: Oil Pump Drive Gear & Oil Pump Driven Gear
Courtesy of GENERAL MOTORS CORP.

6. Matchmark the gear teeth for assembly.
7. Remove the following items:
 - 7.1. The oil pump pressure relief valve spring straight pin

7.2. The oil pump pressure relief spring

7.3. The oil pump pressure relief valve

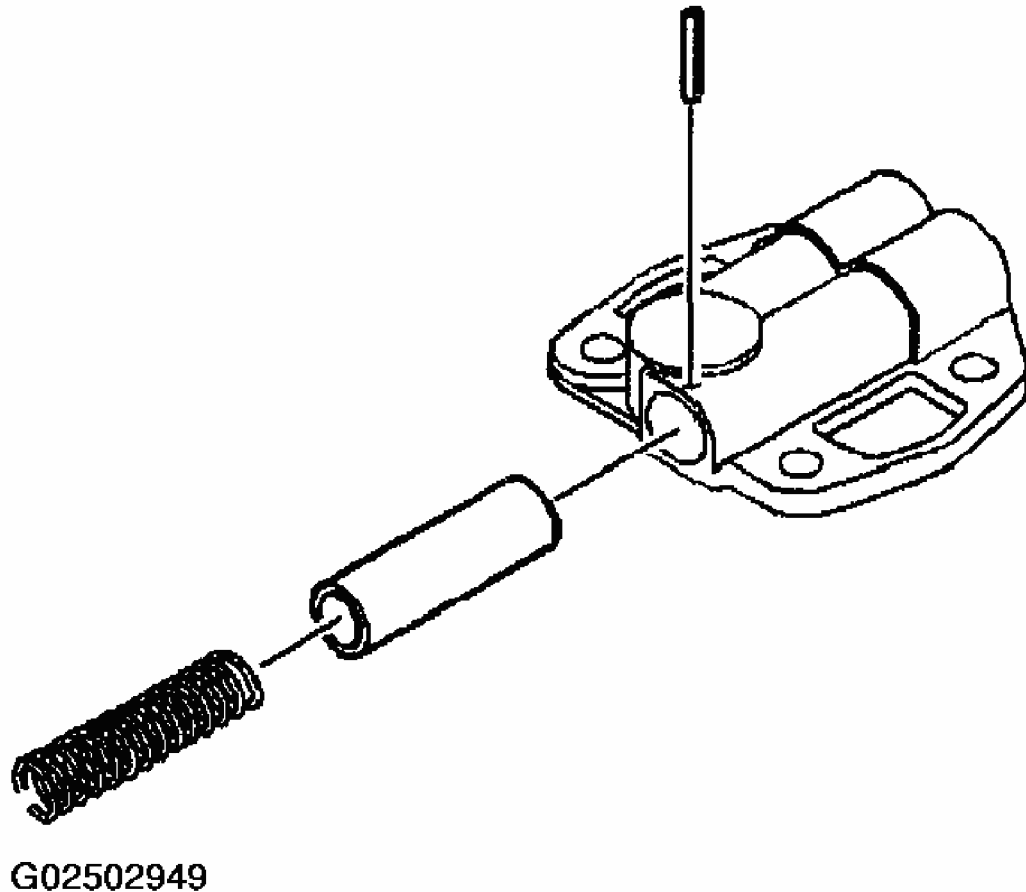


Fig. 208: Oil Pump Pressure Relief Valve & Spring Straight Pin
Courtesy of GENERAL MOTORS CORP.

OIL PUMP CLEANING & INSPECTION

1. Clean the oil pump components in cleaning solvent.
2. Dry the components with compressed air.
3. Inspect the oil pump for the following conditions:
 - Scoring on the top of the gears (1)
 - Damaged gears (2) for the following:
 - Chipping
 - Galling

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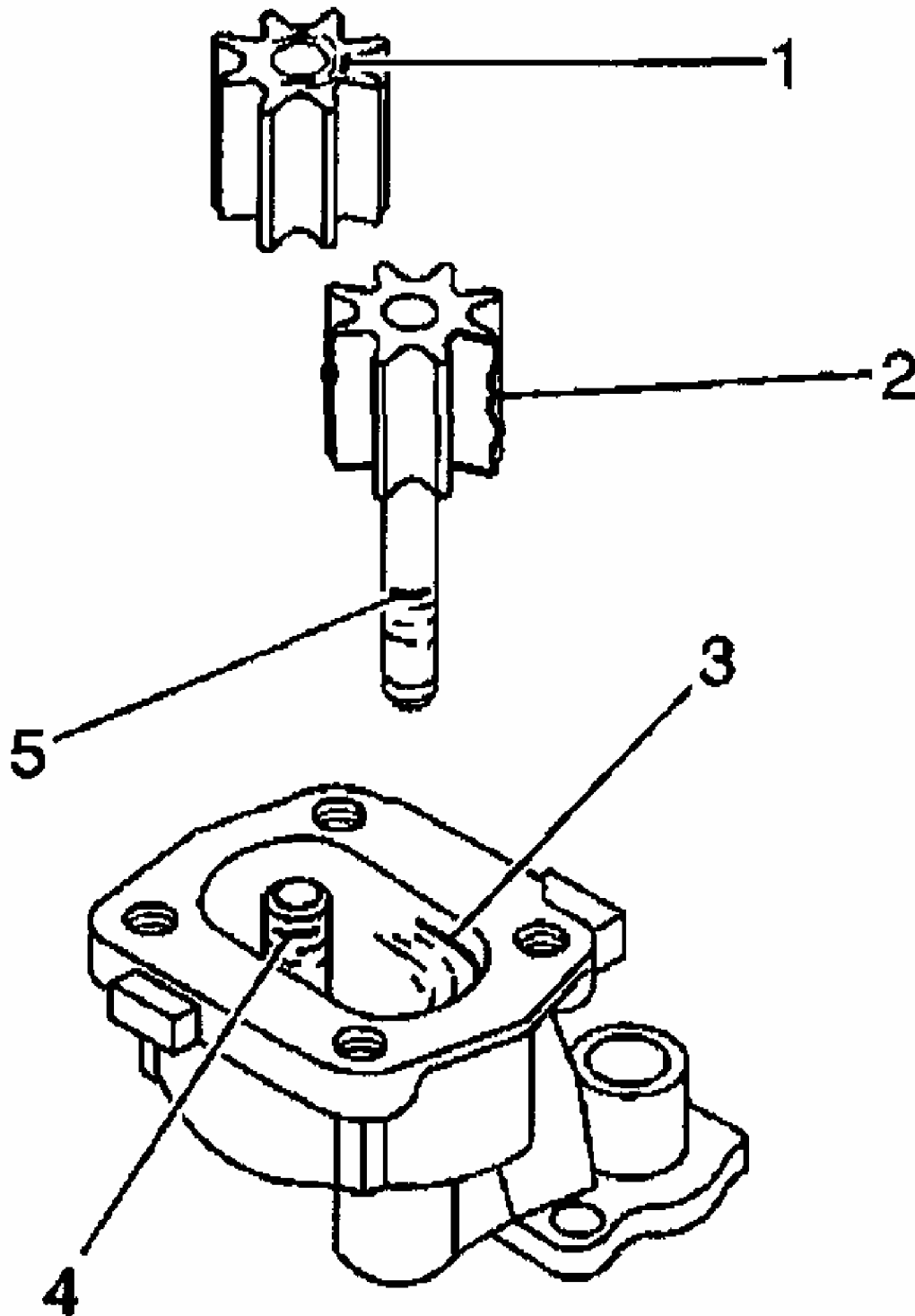
2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

■ Wear

- Scoring, damage or casting imperfections to the body (3)
 - Damaged or scored gear shaft (4)
 - Damaged or scored gear shaft (5)
 - Damaged bolt hole threads
 - Worn oil pump driveshaft bore
 - Damaged or sticking oil pump pressure relief valve
 - Minor imperfections may be removed with a fine oil stone.
 - Collapsed or broken oil pump pressure relief valve spring
4. If the oil pump is to be reused, install a NEW oil pump pressure relief valve spring.
 5. During oil pump installation, install a NEW oil pump driveshaft retainer.

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)



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Fig. 209: Oil Pump Assembly

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

Courtesy of GENERAL MOTORS CORP.

OIL PUMP ASSEMBLE

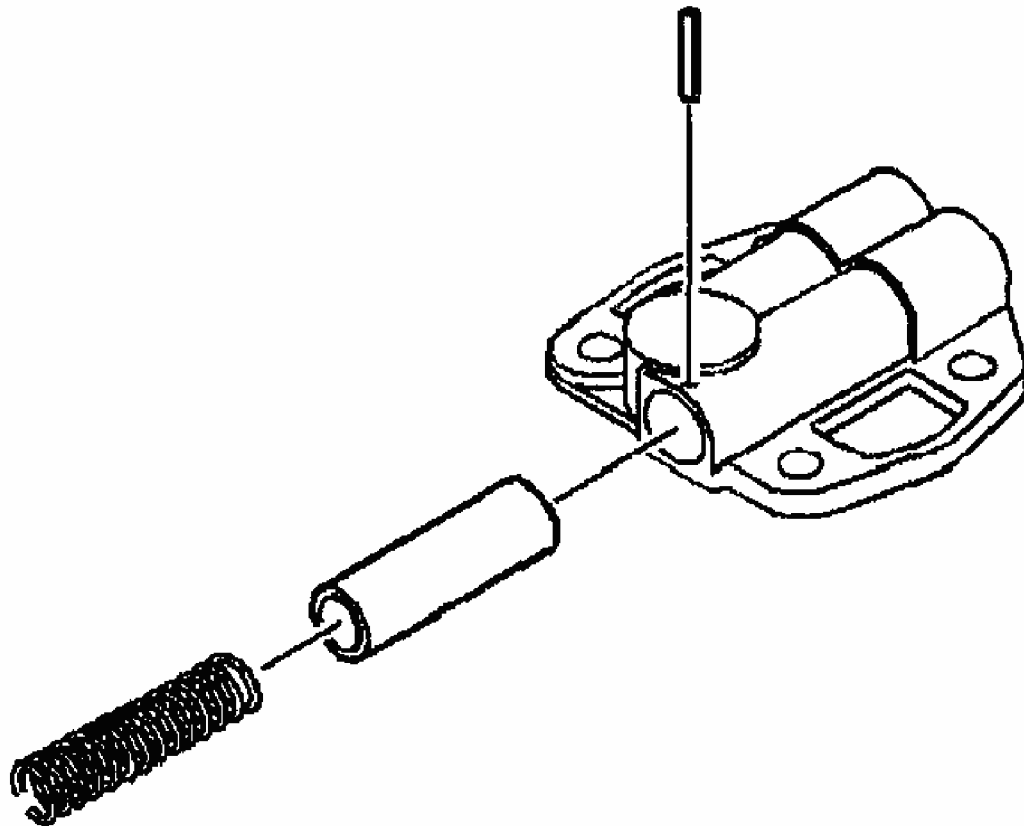
Tools Required

J 21882 Oil Suction Pipe Installer

1. Apply clean engine oil GM P/N United States 12345610, GM P/N Canada 993193, or equivalent, to the oil pump pressure relief valve, oil pump pressure relief valve spring, and oil pump body.

Important: Replace the oil pump pressure relief valve spring when you reuse the oil pump.

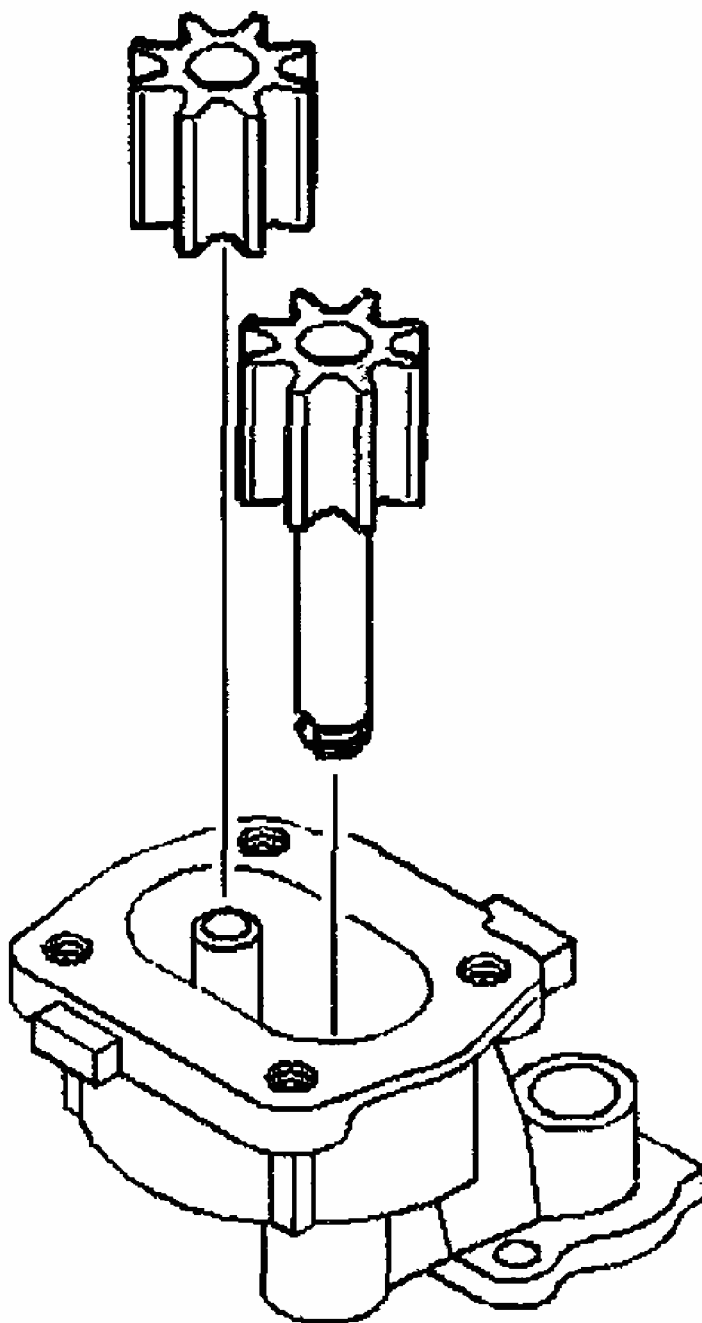
2. Install the following items:
 - 2.1. The oil pump pressure relief valve
 - 2.2. The oil pump pressure relief valve spring
 - 2.3. The oil pump pressure relief valve spring straight pin



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Fig. 210: Oil Pump Pressure Relief Valve & Spring
Courtesy of GENERAL MOTORS CORP.

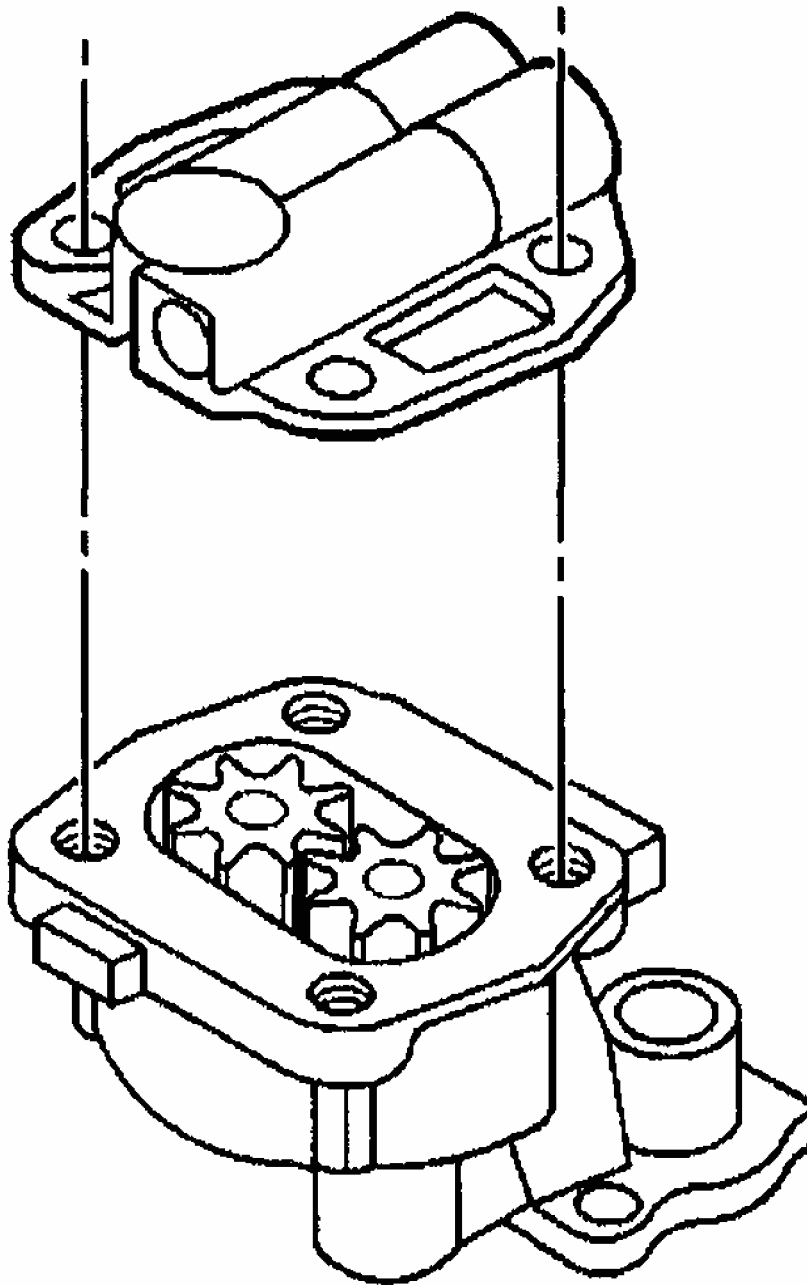
3. Apply clean engine oil GM P/N United States 12345610, GM P/N Canada 993193, or equivalent, to the oil pump drive gear, the oil pump driven gear, and the oil pump body internal surfaces.
4. Install the oil pump drive gear and the oil pump driven gear into the oil pump body.
 - 4.1. Align the matchmarks on the oil pump drive and driven gears.
 - 4.2. Install the smooth side of the oil pump drive and driven gears toward the oil pump cover.



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Fig. 211: Oil Pump Drive Gear & Driven Gear
Courtesy of GENERAL MOTORS CORP.

5. Install the oil pump cover.



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Fig. 212: Oil Pump Cover
Courtesy of GENERAL MOTORS CORP.

6. Install the oil pump cover bolts. Tighten the bolts to 12 N.m (106 lb in).
7. Inspect the oil pump for smoothness of operation by turning the oil pump driveshaft by hand.

8. Install the oil pump screen.

8.1. If removed, replace the oil pump screen. The oil pump screen must have a good press fit into the oil pump body.

8.2. Mount the oil pump in a soft jawed vise.

8.3. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the end of the oil pump screen pipe.

8.4. Use the J 21882 and a soft-faced hammer in order to tap the oil pump screen into the pump body.

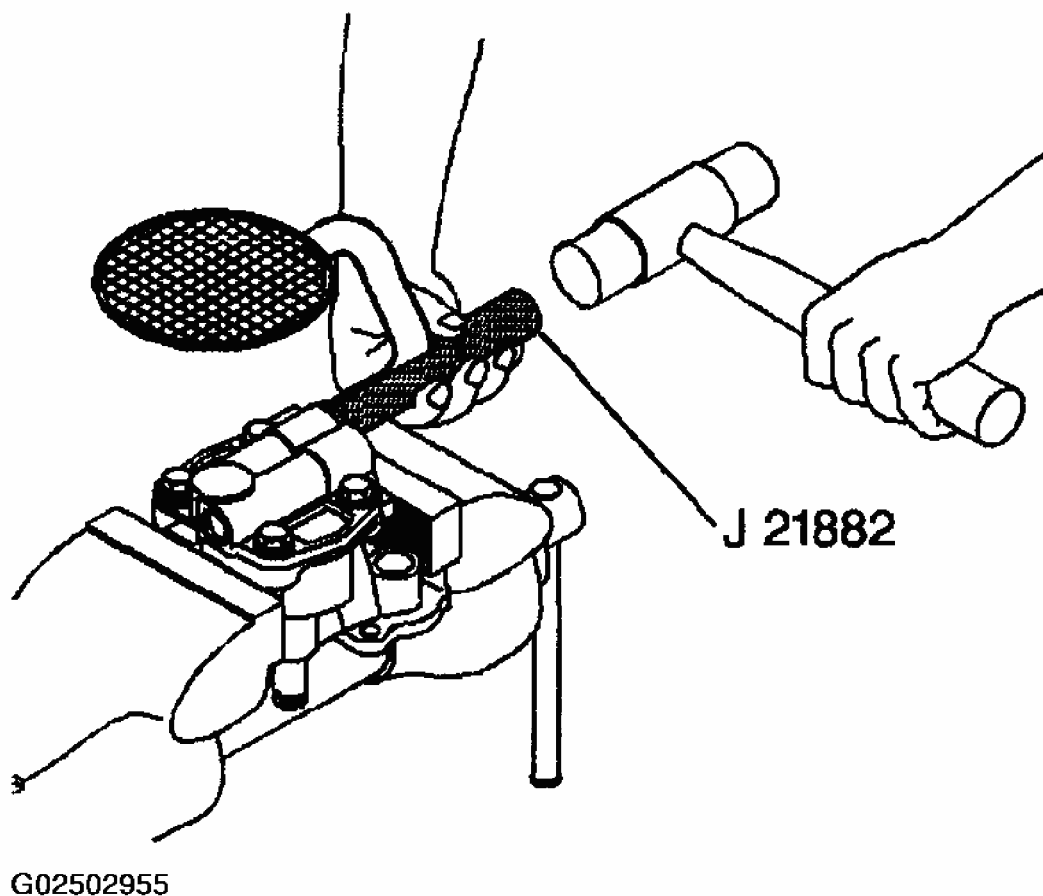
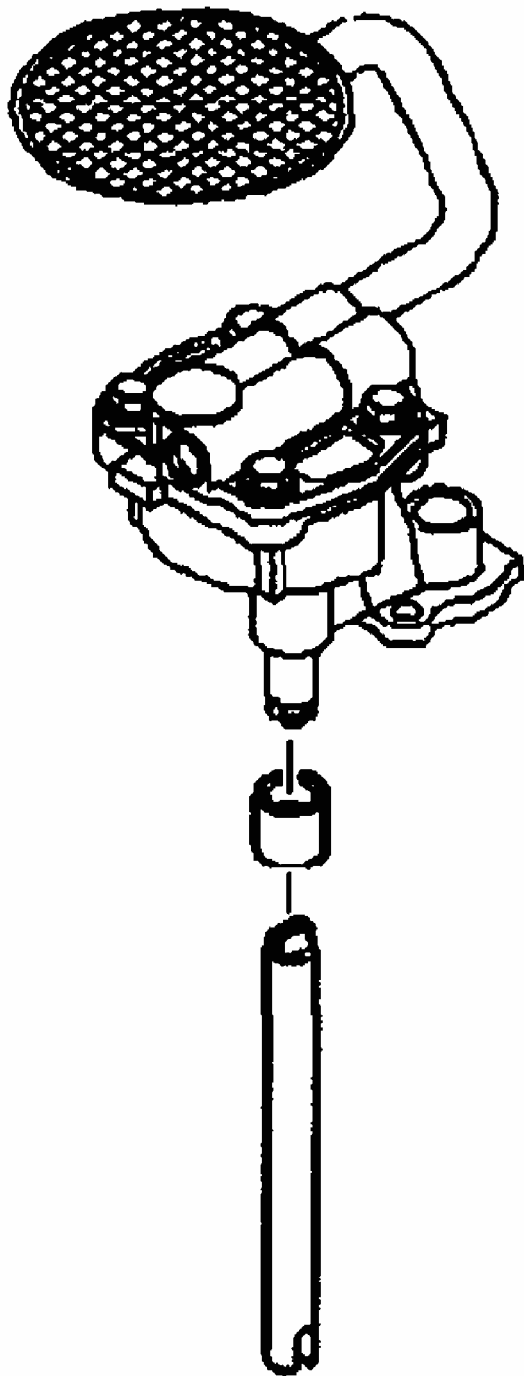


Fig. 213: Oil Pump Screen
Courtesy of GENERAL MOTORS CORP.

The oil pump screen must align parallel with the bottom of the oil pan when the oil pan is installed.

Important: Install a NEW oil pump driveshaft retainer during assembly.

9. Install the oil pump driveshaft and the NEW oil pump driveshaft retainer.



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Fig. 214: Oil Pump Driveshaft
Courtesy of GENERAL MOTORS CORP.

1. Clean the valve rocker arm cover in cleaning solvent.
2. Dry the valve rocker arm cover with compressed air.
3. Inspect the valve rocker arm cover for the following:
 - Damage to the PCV valve grommet (1)
 - Damage to the bolt holes (2)
 - A damaged valve rocker arm cover may interfere with the valve rocker arms.
 - Damage to the exterior of the valve rocker arm cover (3)
 - Gouges or damage to the sealing surface (4)
 - Damage to the oil fill tube grommet (5)
 - Restrictions to the ventilation system passages

OIL PAN CLEANING & INSPECTION

1. Remove the oil pan baffle bolts and the oil pan baffle.

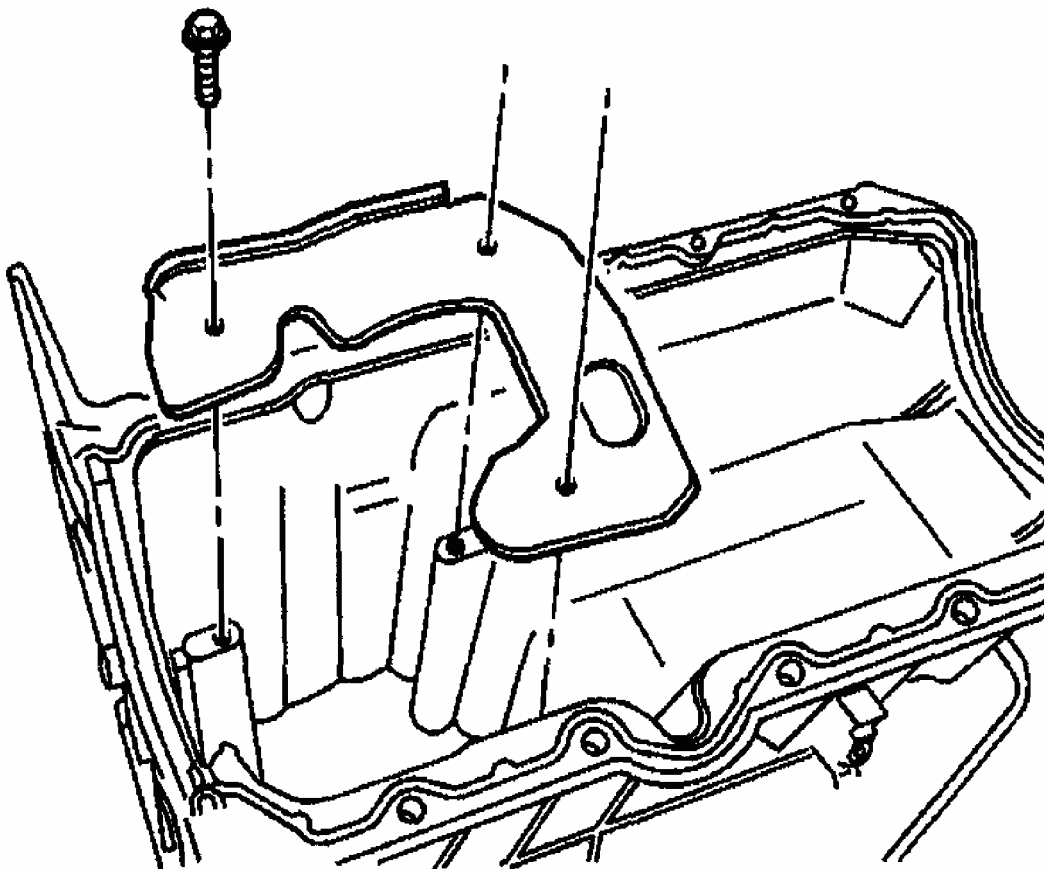
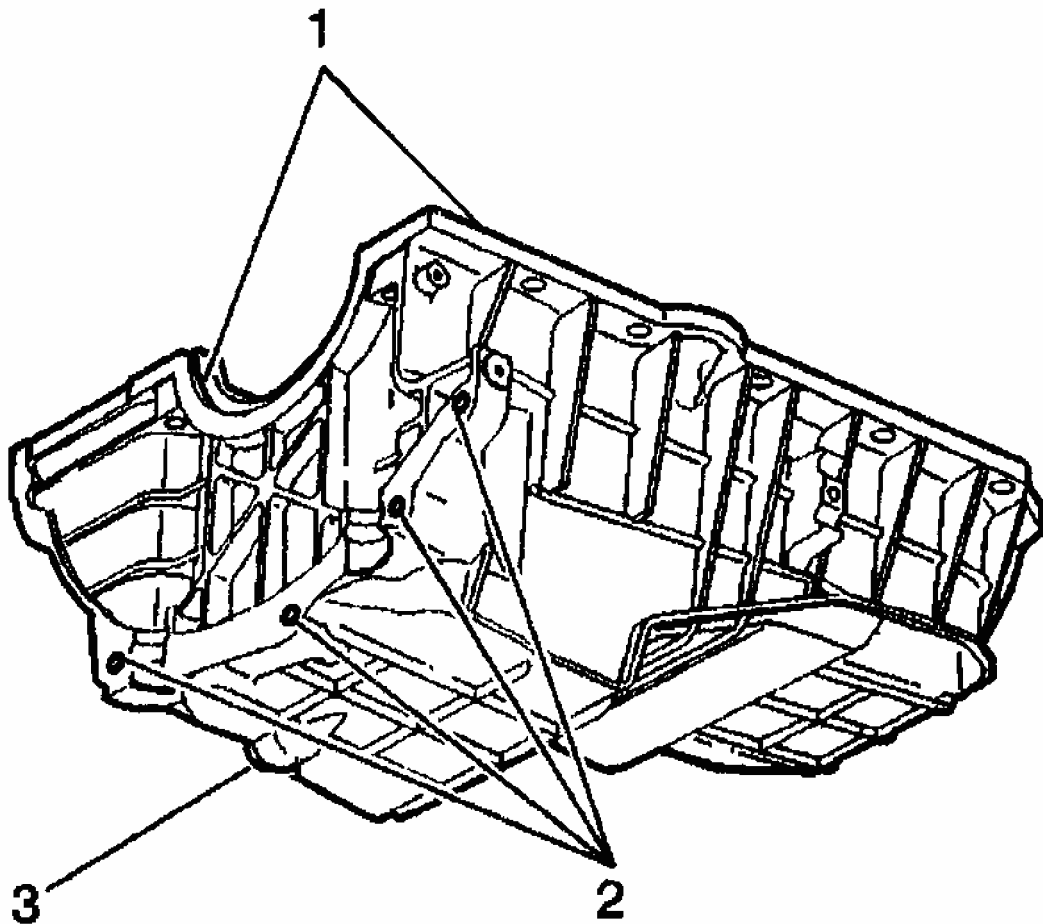


Fig. 215: Oil Pan Baffle

Courtesy of GENERAL MOTORS CORP.

2. Clean the oil pan and oil pan baffle in cleaning solvent.
3. Dry the oil pan and oil pan baffle with compressed air.
4. Inspect the oil pan for the following:
 - Gouges or damage to the oil pan sealing surfaces (1)
 - Damage to the threaded holes (2)
 - Damaged oil pan drain hole threads (3)
 - Damage to the oil pan baffle
 - Damage to the exterior of the oil pan
 - A damaged oil pan may interfere with the proper position of the oil pump screen, or may not distribute oil properly in the oil pan sump area.



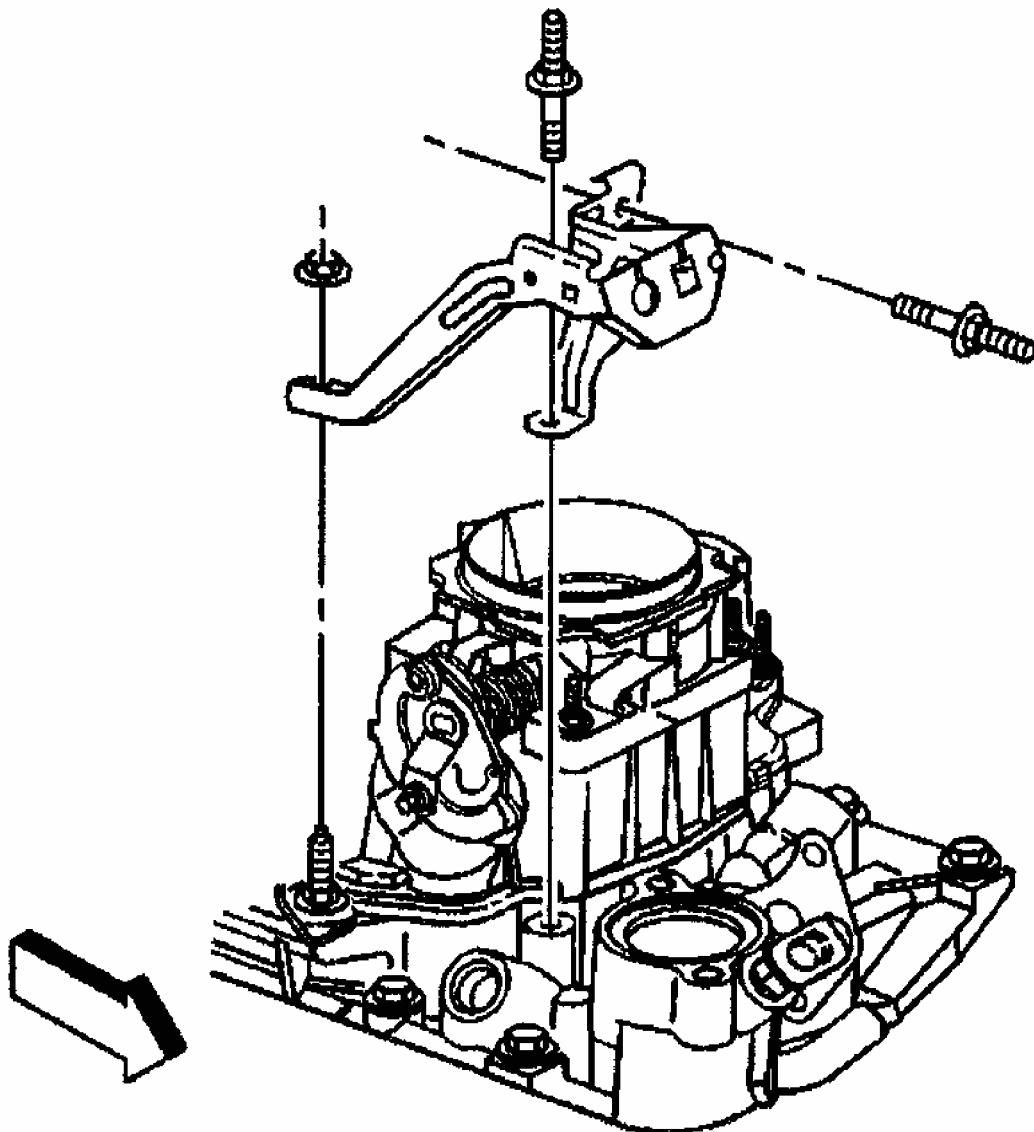
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Fig. 216: Oil Pan Assembly
Courtesy of GENERAL MOTORS CORP.

5. Install the oil pan baffle and the bolts. Tighten the oil pan baffle bolts to 12 N.m (106 lb in).

INTAKE MANIFOLD DISASSEMBLE (L35)

1. Remove the nuts, the studs, and the accelerator control cable bracket.

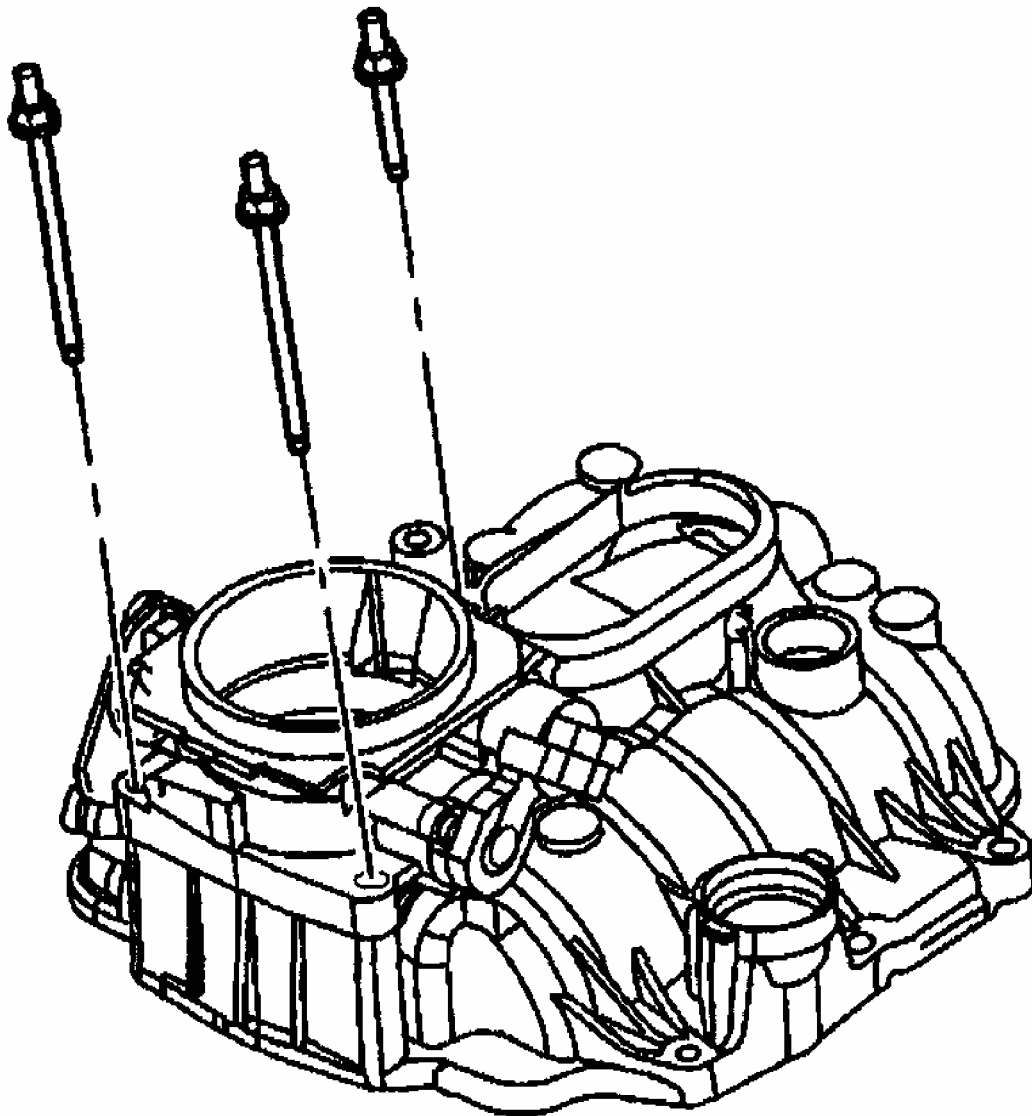


G02502961

Fig. 217: Accelerator Control Cable Bracket

Courtesy of GENERAL MOTORS CORP.

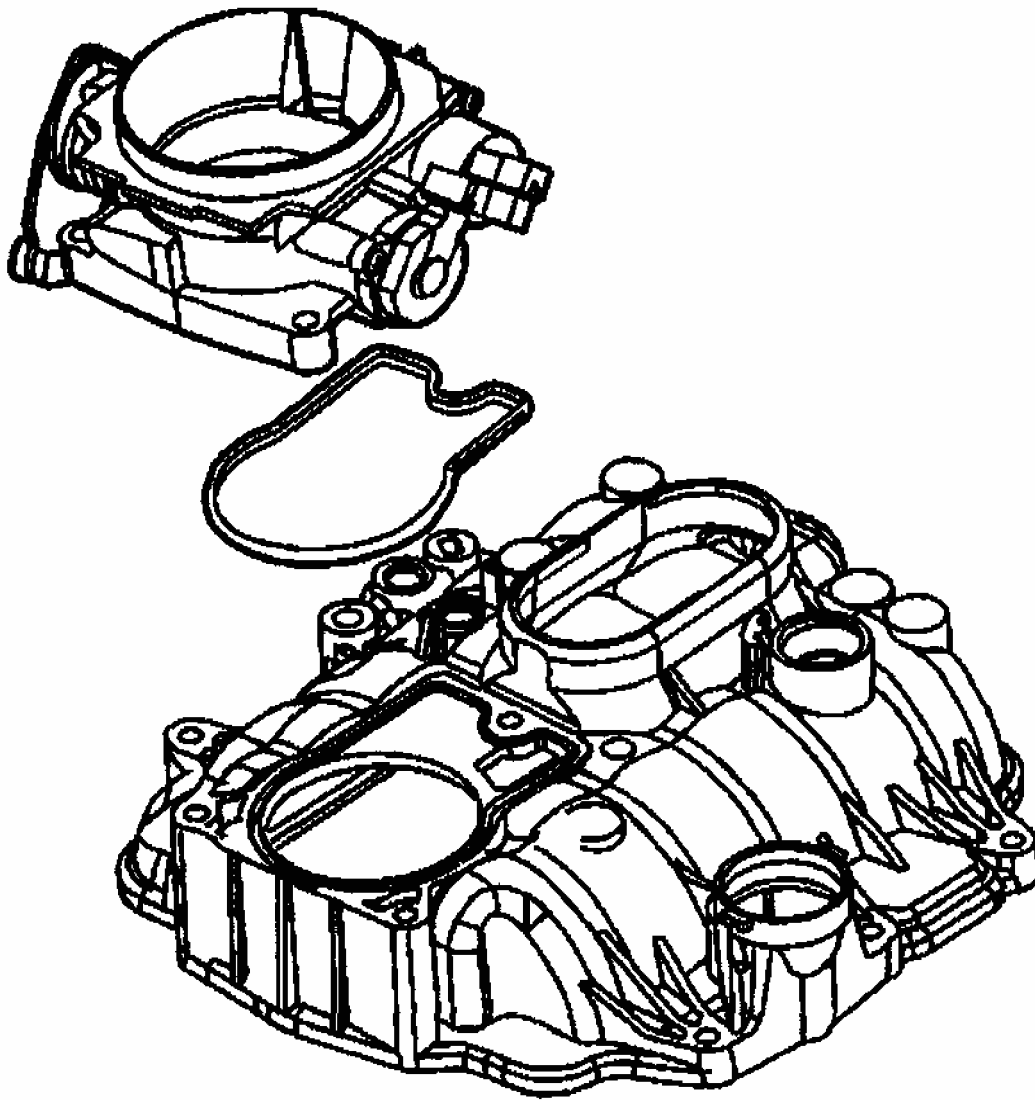
2. Remove the throttle body attaching studs.



G02502962

Fig. 218: Throttle Body Attaching Studs
Courtesy of GENERAL MOTORS CORP.

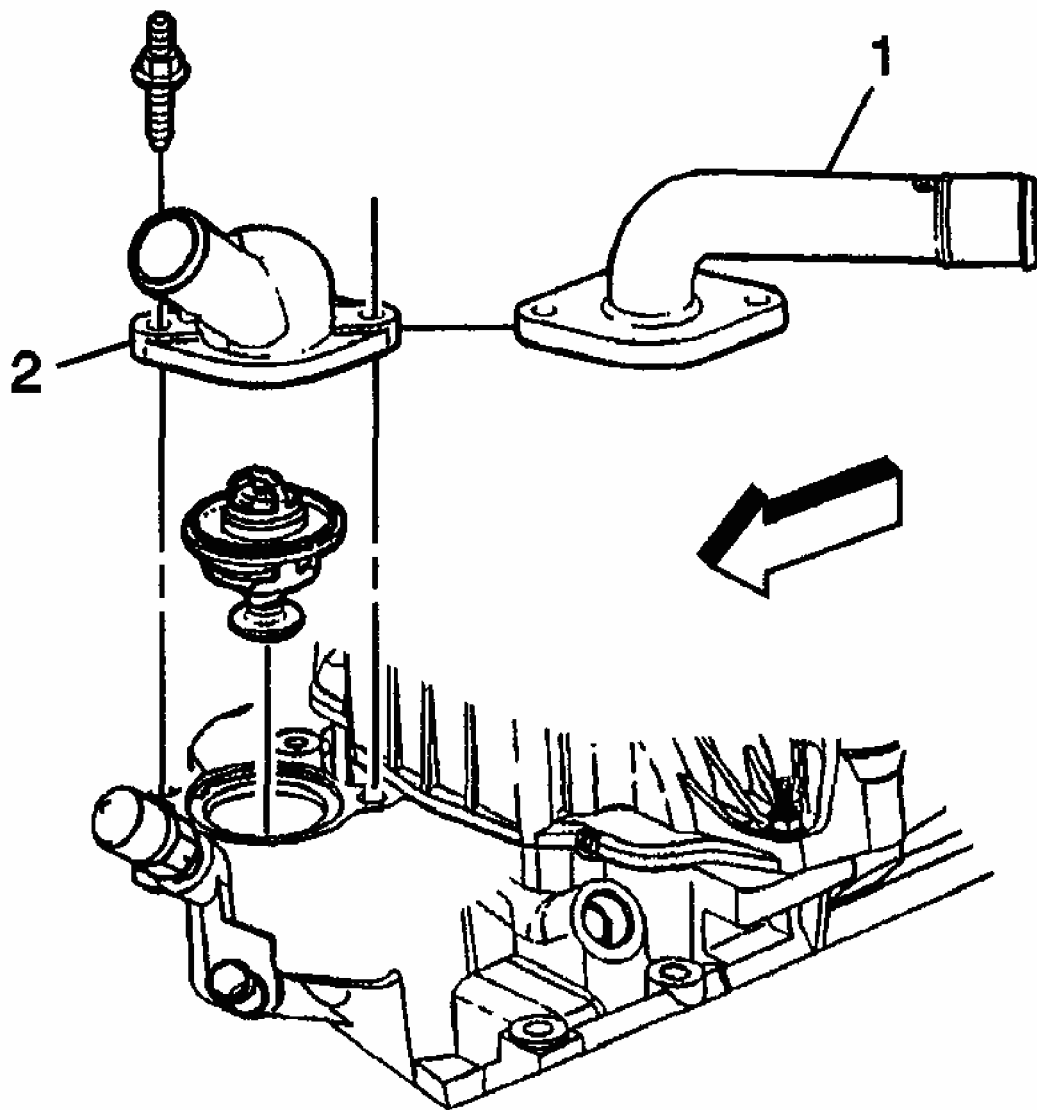
3. Remove the throttle body.
4. Remove the throttle body to upper intake manifold gasket.
5. Discard the throttle body to upper intake manifold gasket.



G02502963

Fig. 219: Throttle Body-To-Upper Intake Manifold Gasket
Courtesy of GENERAL MOTORS CORP.

6. Remove the water outlet studs.
7. Remove the water outlet (1 or 2).
8. Remove the engine coolant thermostat.

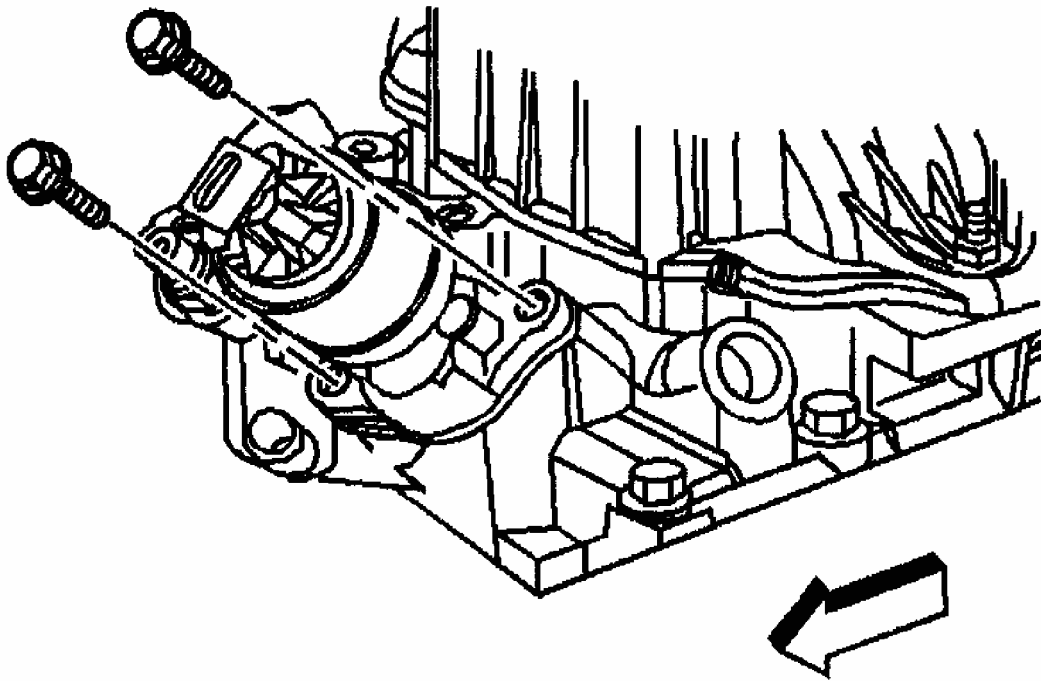


G02502964

Fig. 220: Engine Coolant Thermostat
Courtesy of GENERAL MOTORS CORP.

Important: Note the position and direction of the exhaust gas recirculation (EGR) valve before removal. It is possible to improperly install the EGR valve 180 degrees from the original position.

9. Remove the exhaust gas recirculation (EGR) valve bolts. Some applications will not have an EGR valve.

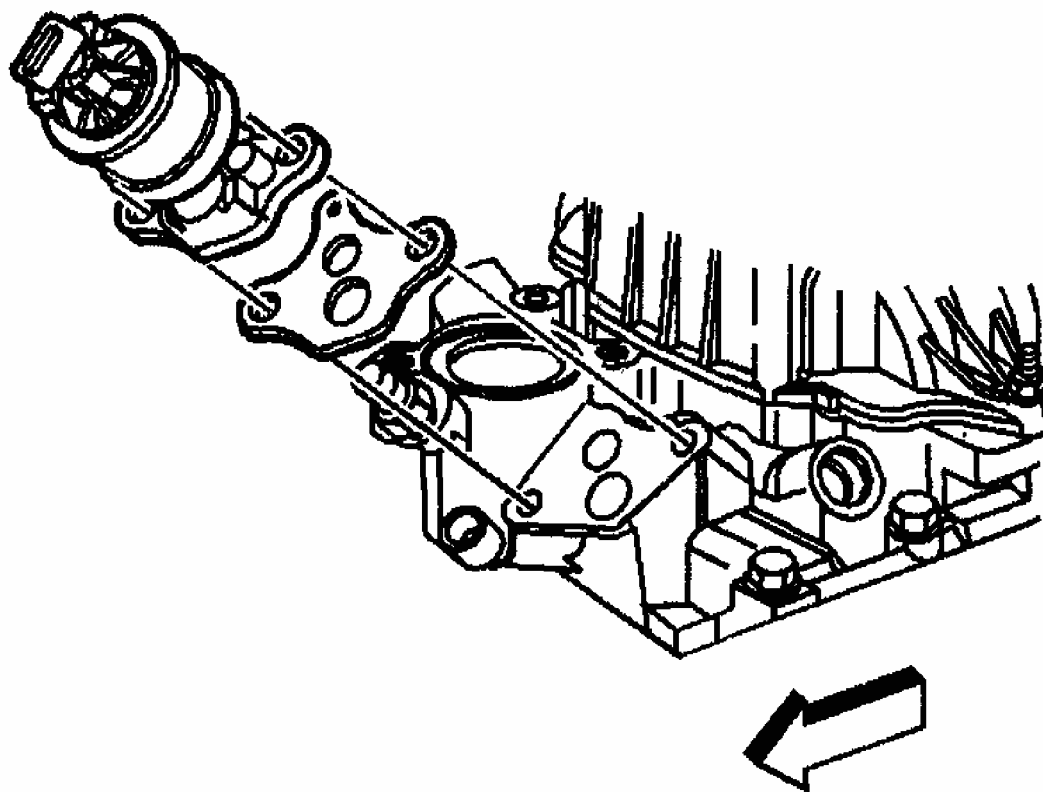


G02502965

Fig. 221: Locating EGR Valve
Courtesy of GENERAL MOTORS CORP.

NOTE: The Linear EGR valve is an electrical component. DO NOT soak in any liquid cleaner or solvent because damage may result.

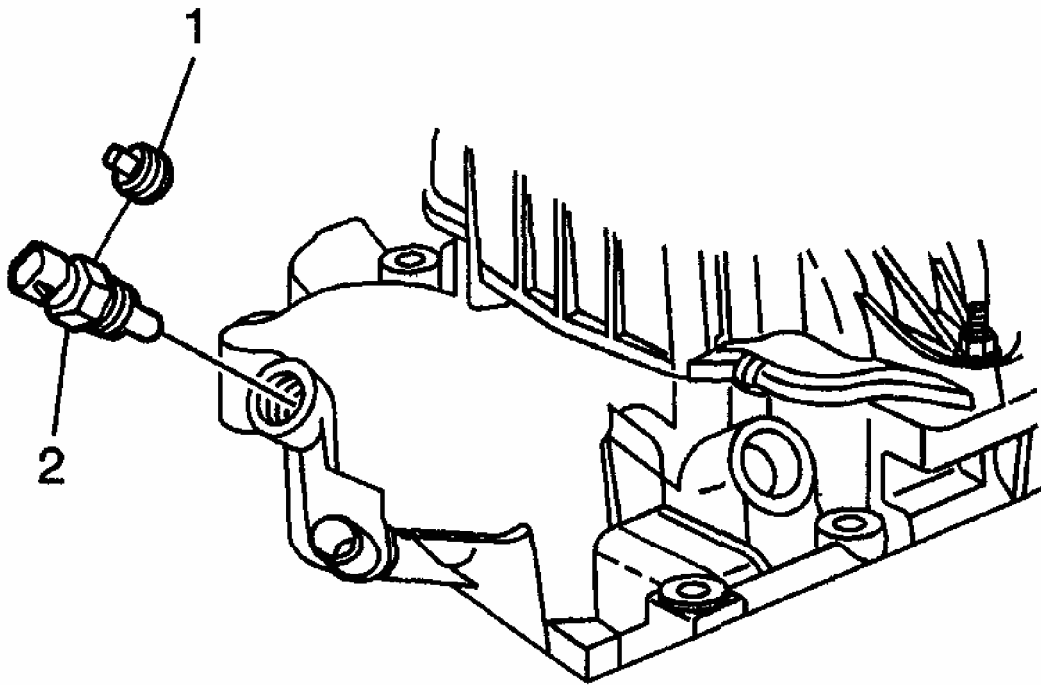
10. Remove the EGR valve and the EGR valve gasket from the lower intake manifold.
11. Discard the EGR valve gasket.



G02502966

Fig. 222: EGR Valve Gasket
Courtesy of GENERAL MOTORS CORP.

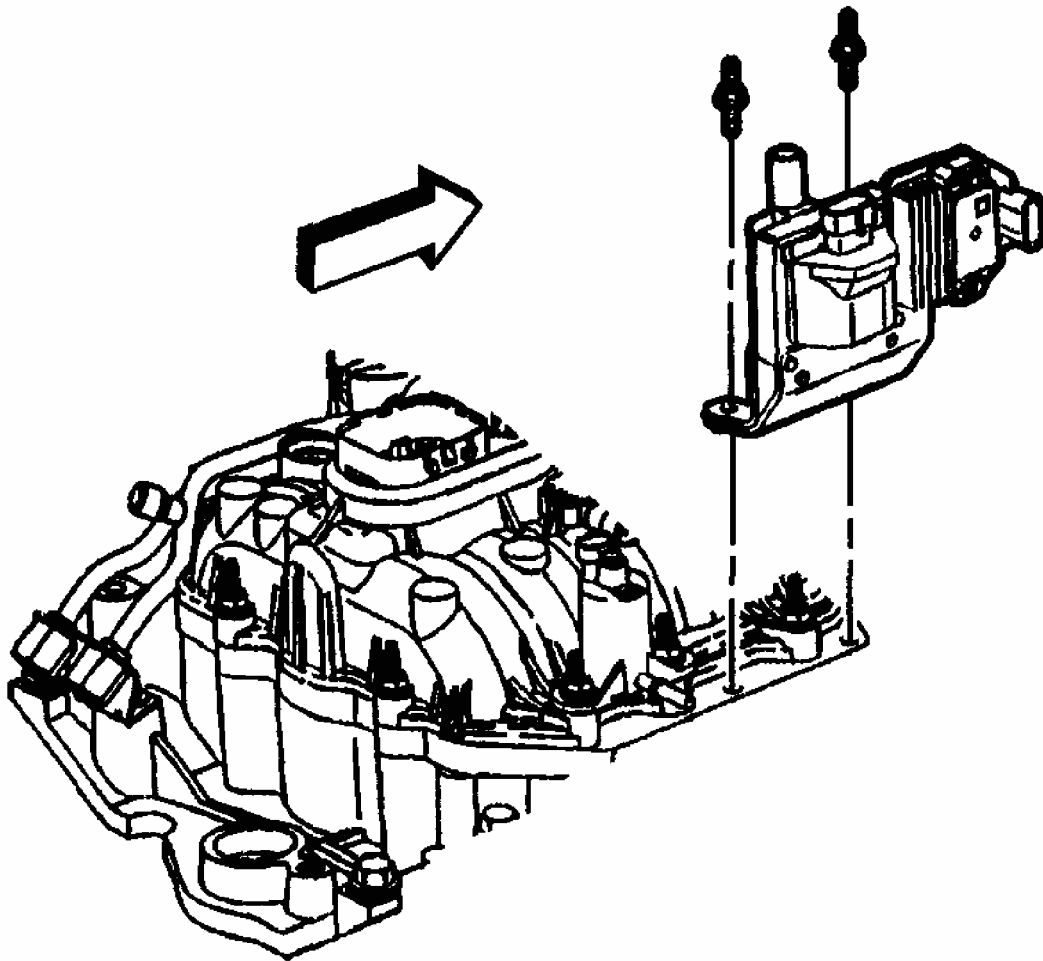
12. Remove the engine coolant temperature (ECT) sensor plug (1) or the ECT sensor (2) from the front of the lower intake manifold, if equipped.



G02502967

Fig. 223: ECT Sensor Plug Or ECT Sensor
Courtesy of GENERAL MOTORS CORP.

13. Remove the studs and the ignition coil.

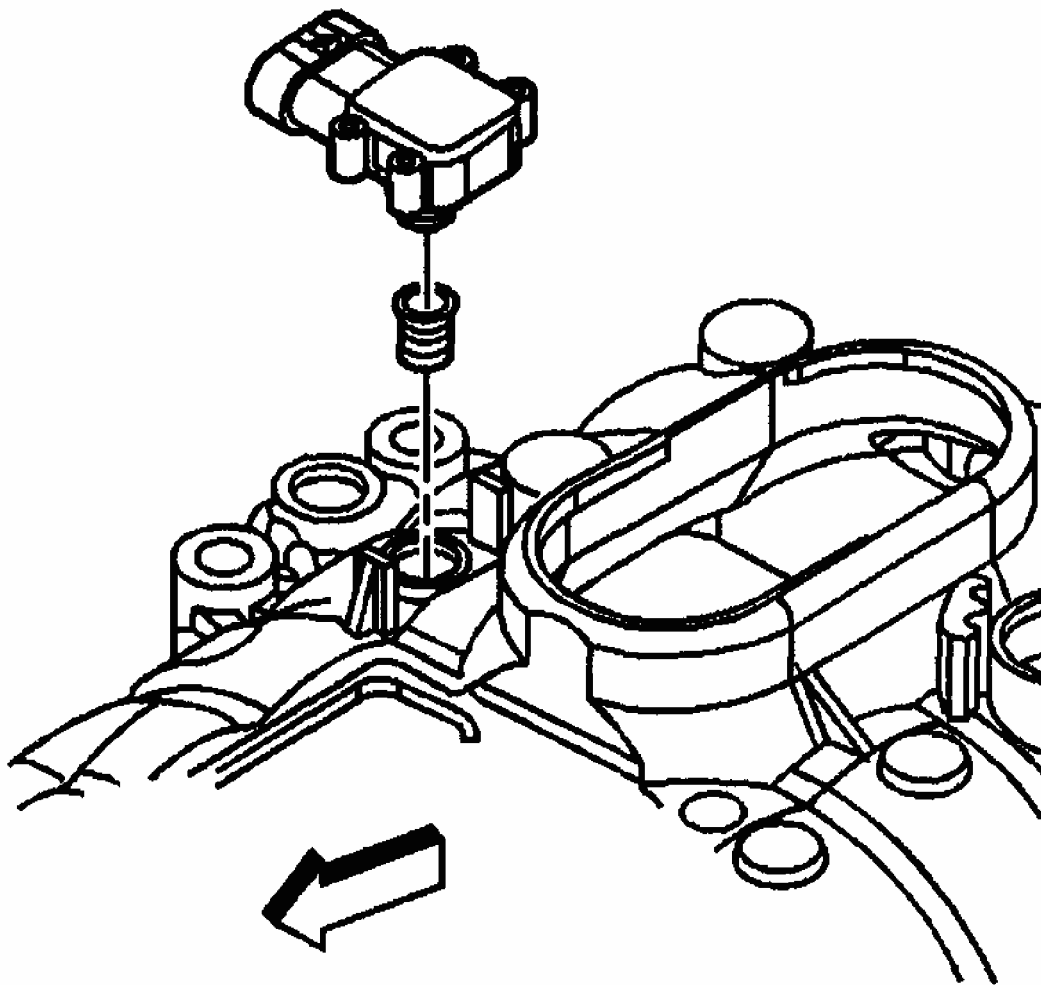


G02502968

Fig. 224: Ignition Coil

Courtesy of GENERAL MOTORS CORP.

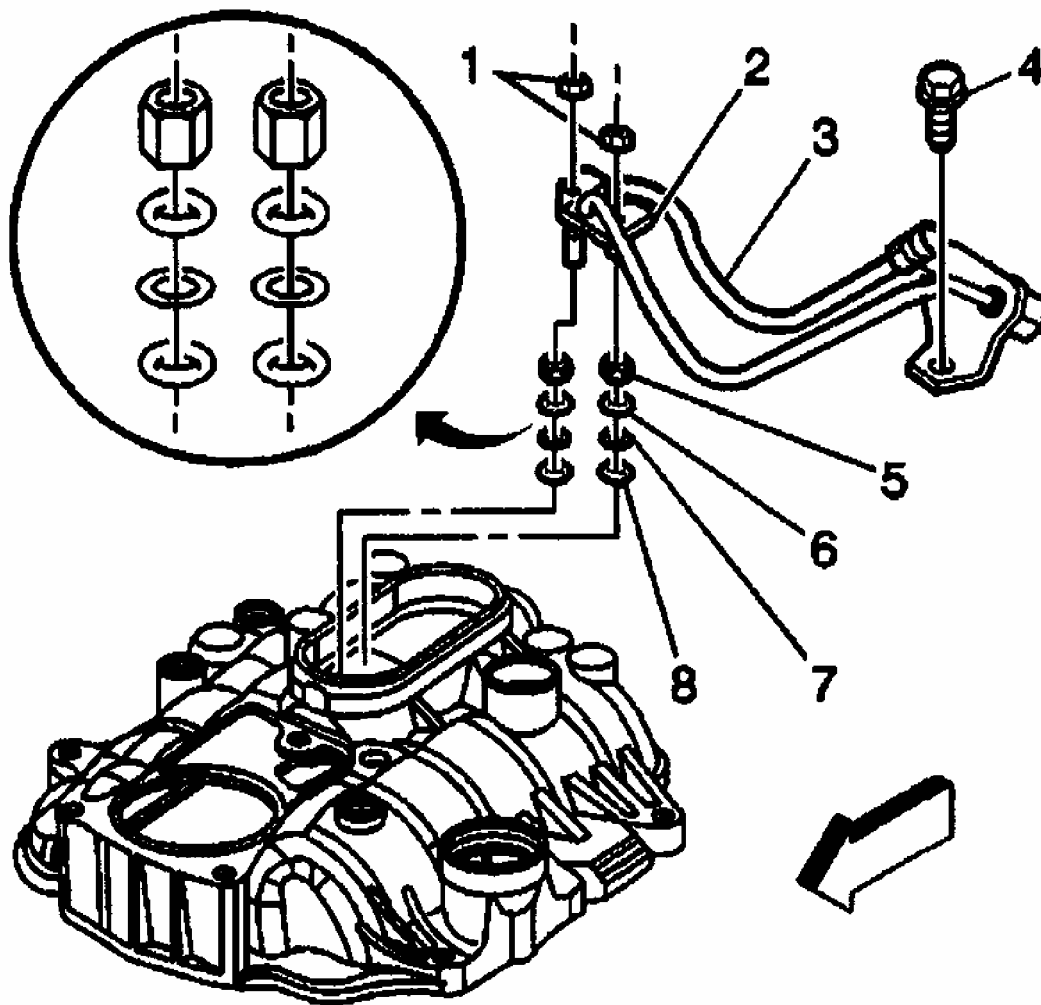
14. Remove the manifold absolute pressure (MAP) sensor.
15. Remove the MAP sensor seal from the MAP sensor.
16. Discard the MAP sensor seal.



G02502969

Fig. 225: MAP Sensor
Courtesy of GENERAL MOTORS CORP.

17. Remove the fuel pipe bolt (4).
18. Remove the fuel pipe retainer nuts (1).
19. Remove the fuel pipe retainer (2).
20. Remove the fuel pipe (3).
21. Remove and discard the fuel seal retainers (5).
22. Remove and discard the fuel seals (6), yellow O-rings.
23. Remove and discard the spacer rings (7), fiat washers.
24. Remove and discard the fuel seals (8), black O-rings.

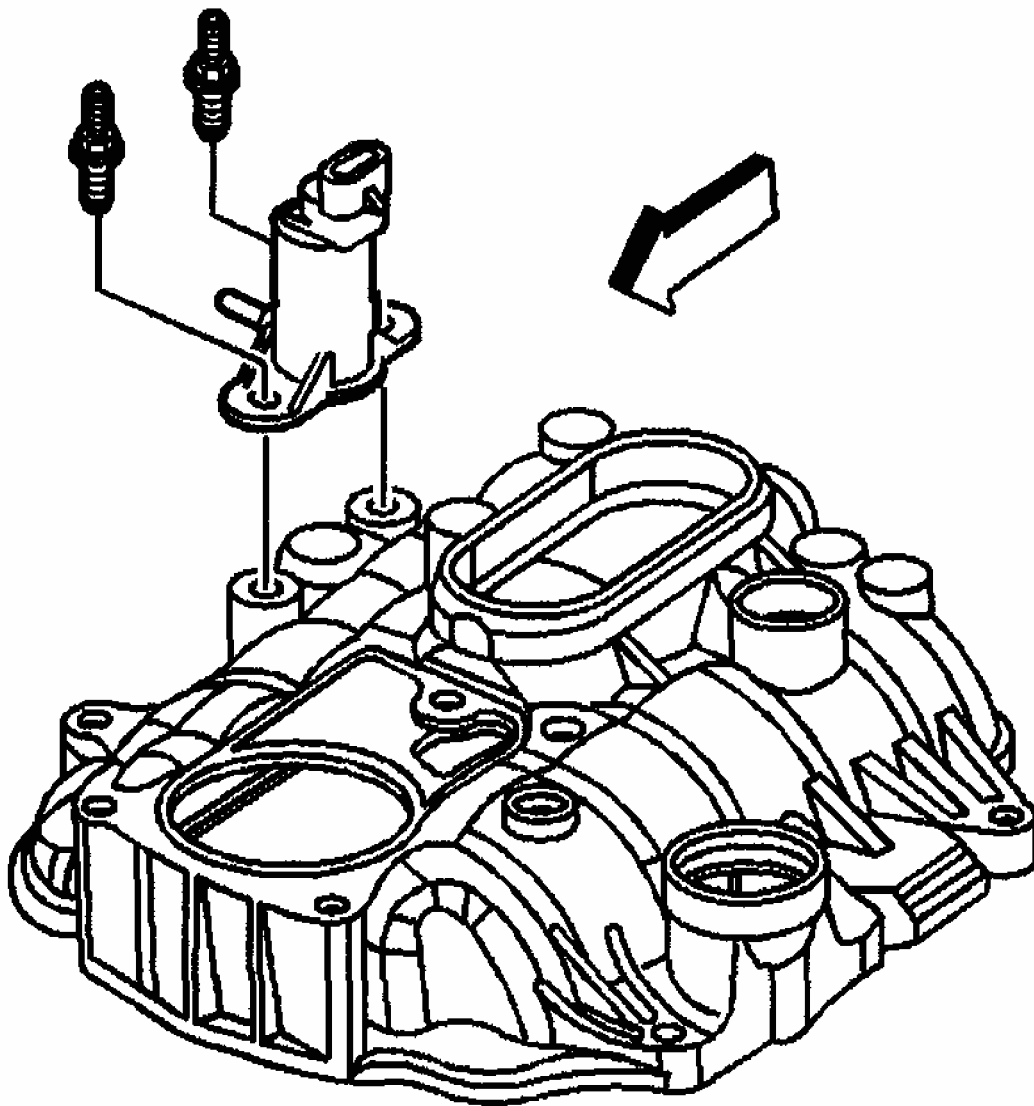


G02502970

Fig. 226: Fuel Pipe Seals

Courtesy of GENERAL MOTORS CORP.

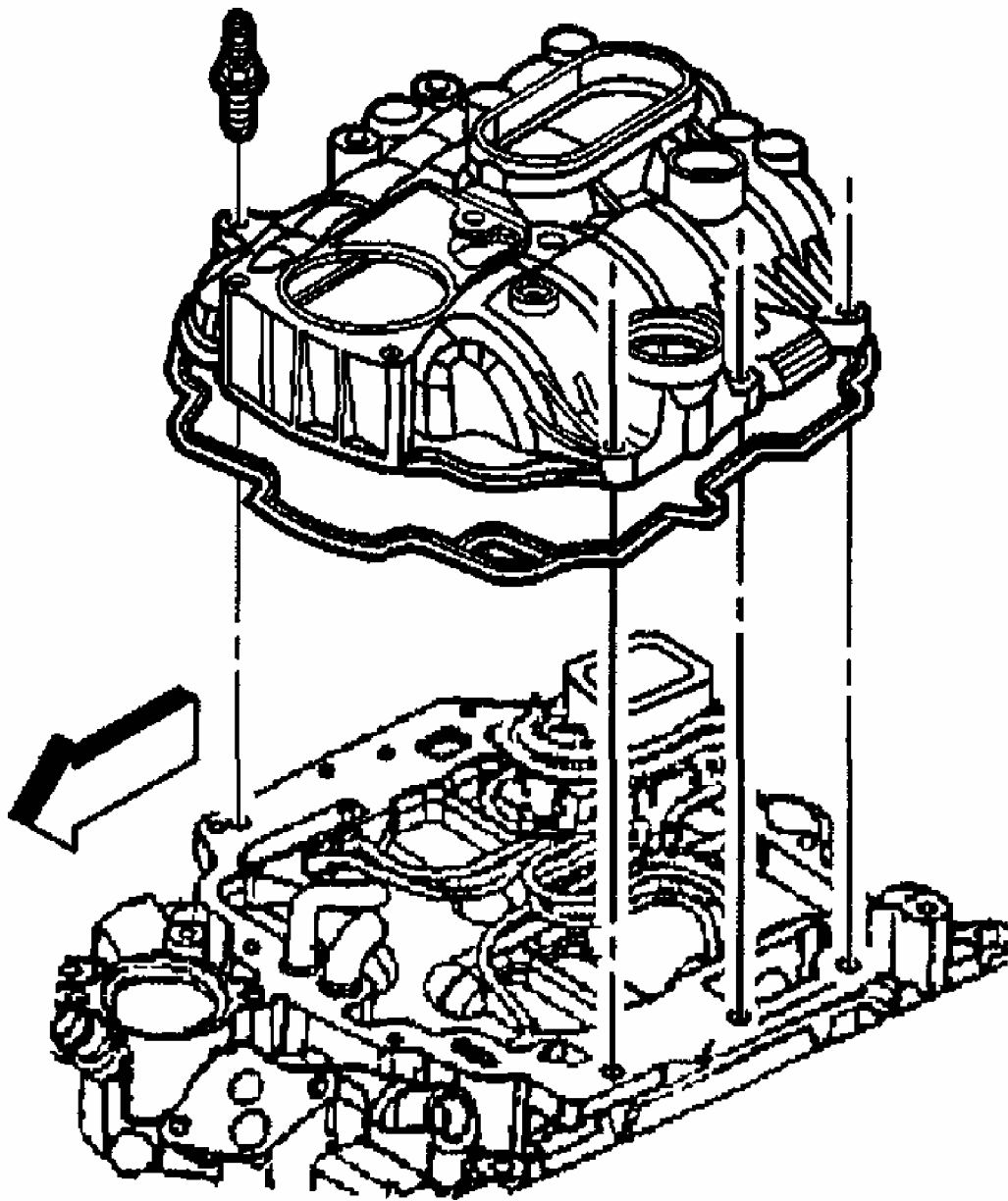
25. Remove the studs and the evaporative emission (EVAP) canister purge solenoid valve.



G02502971

Fig. 227: EVAP Canister Purge Solenoid Valve
Courtesy of GENERAL MOTORS CORP.

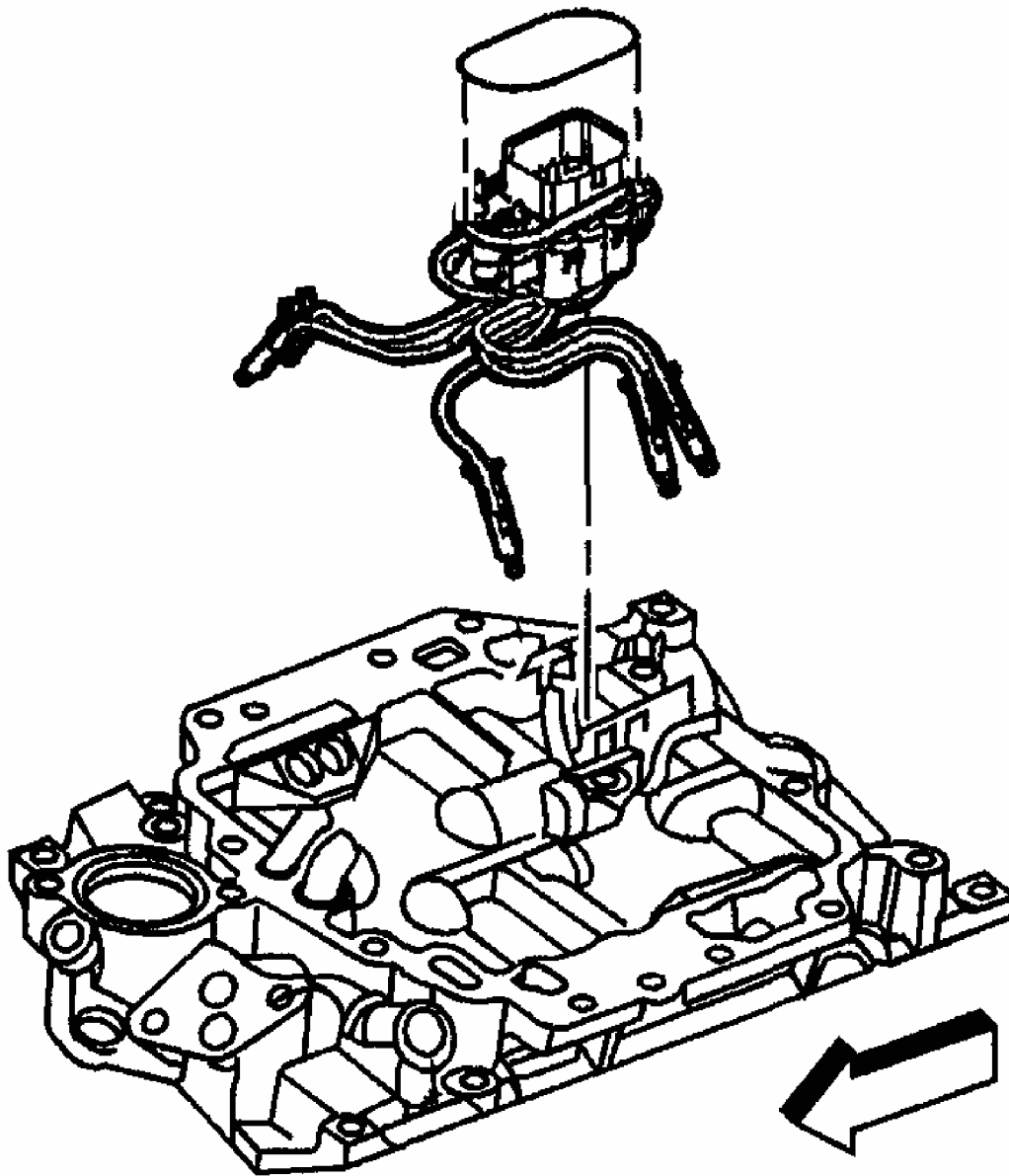
26. Remove the nut and the engine wiring harness bracket.
27. Remove the upper intake manifold attaching studs.
28. Remove the upper intake manifold.
29. Remove the upper intake manifold to lower intake manifold gasket.
30. Discard the upper intake manifold to lower intake manifold gasket.



G02502972

Fig. 228: Upper Intake Manifold-To-Lower Intake Manifold Gasket
Courtesy of GENERAL MOTORS CORP.

31. Remove the fuel meter body seal and discard.
32. Remove the 6 poppet nozzles from the lower intake manifold bores.



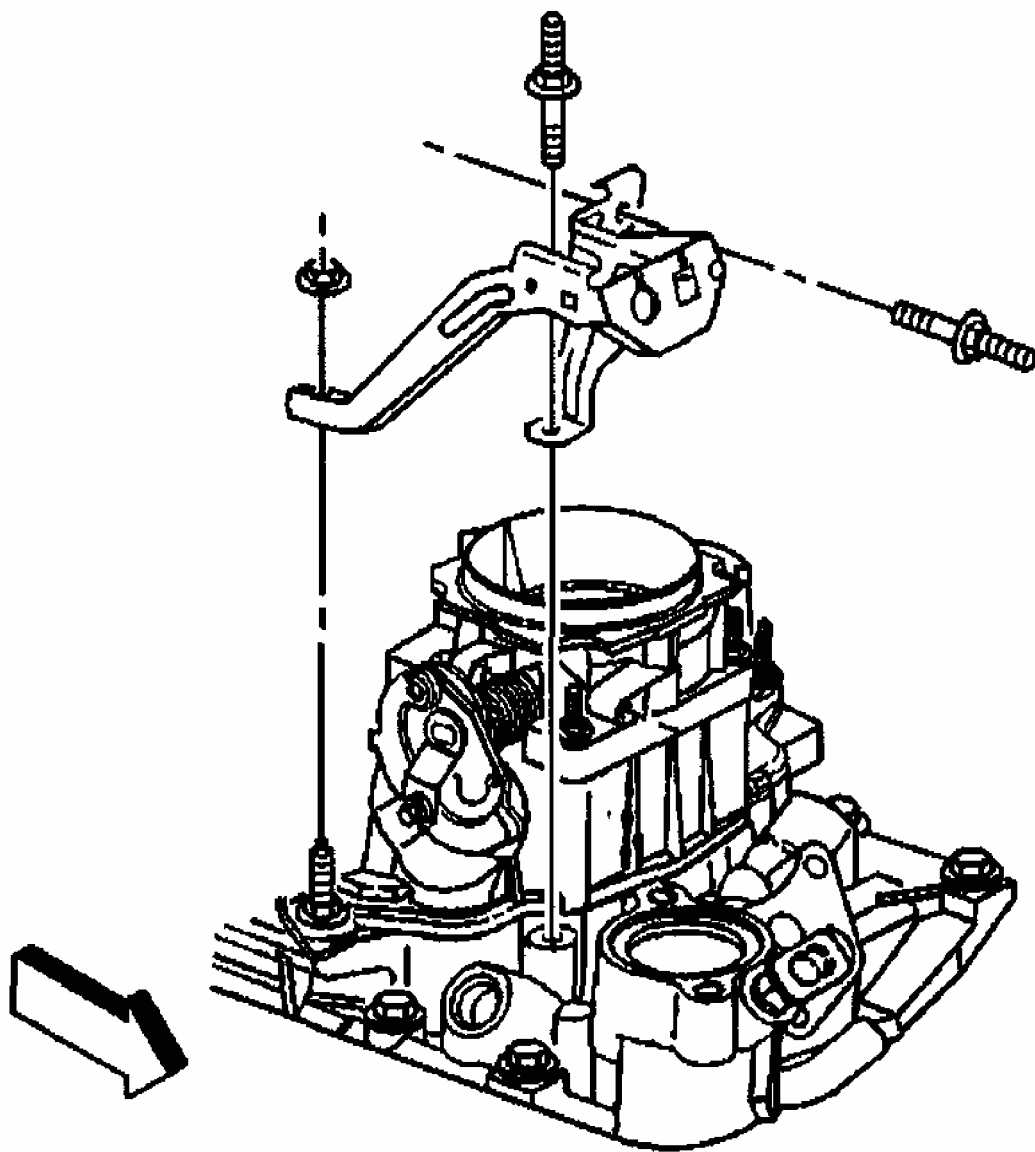
G02502973

Fig. 229: Poppet Nozzles
Courtesy of GENERAL MOTORS CORP.

33. Remove the fuel meter body.
34. Remove the bolt and the fuel meter body bracket.

INTAKE MANIFOLD DISASSEMBLE (LU3)

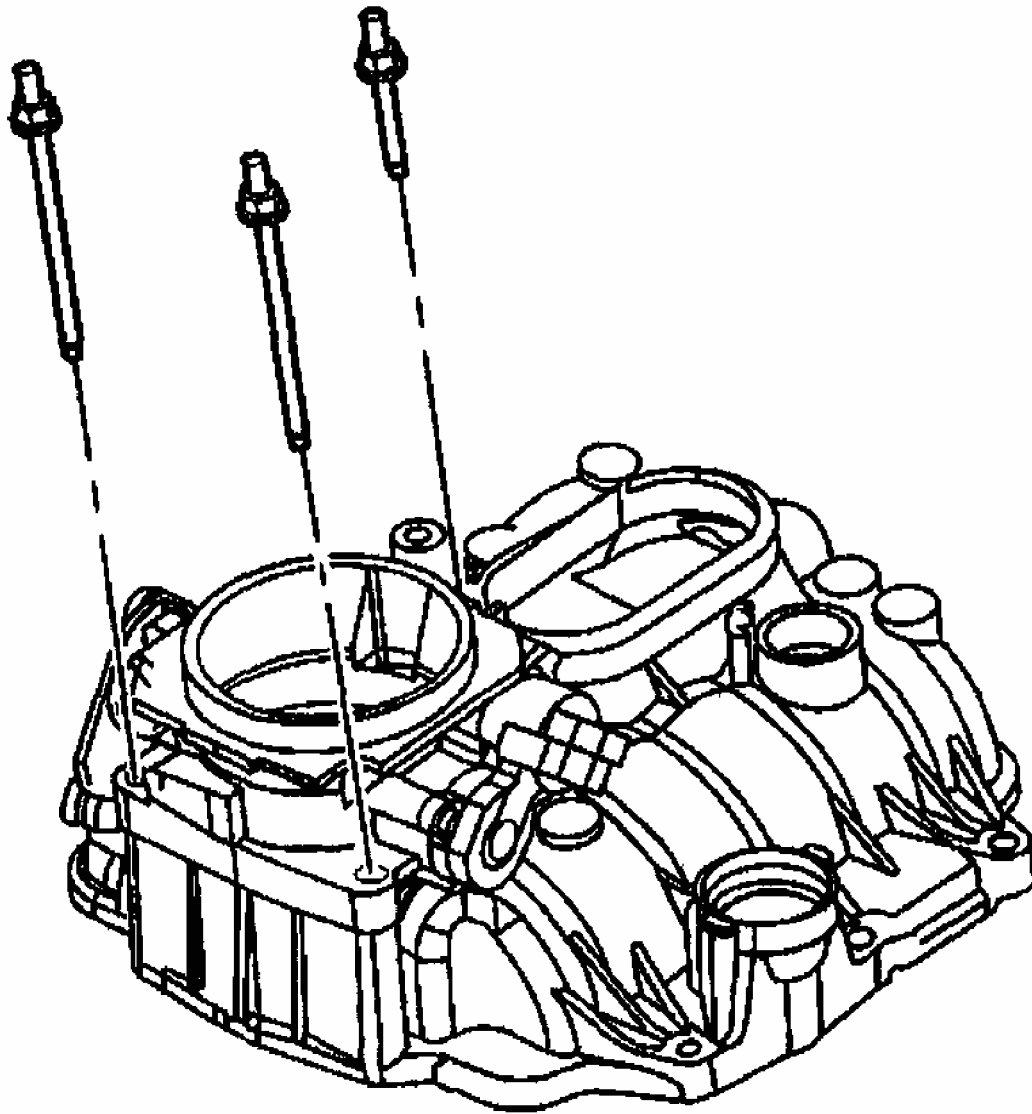
1. Remove the nuts, the studs, and the accelerator control cable bracket.



G02502974

Fig. 230: Accelerator Control Cable Bracket
Courtesy of GENERAL MOTORS CORP.

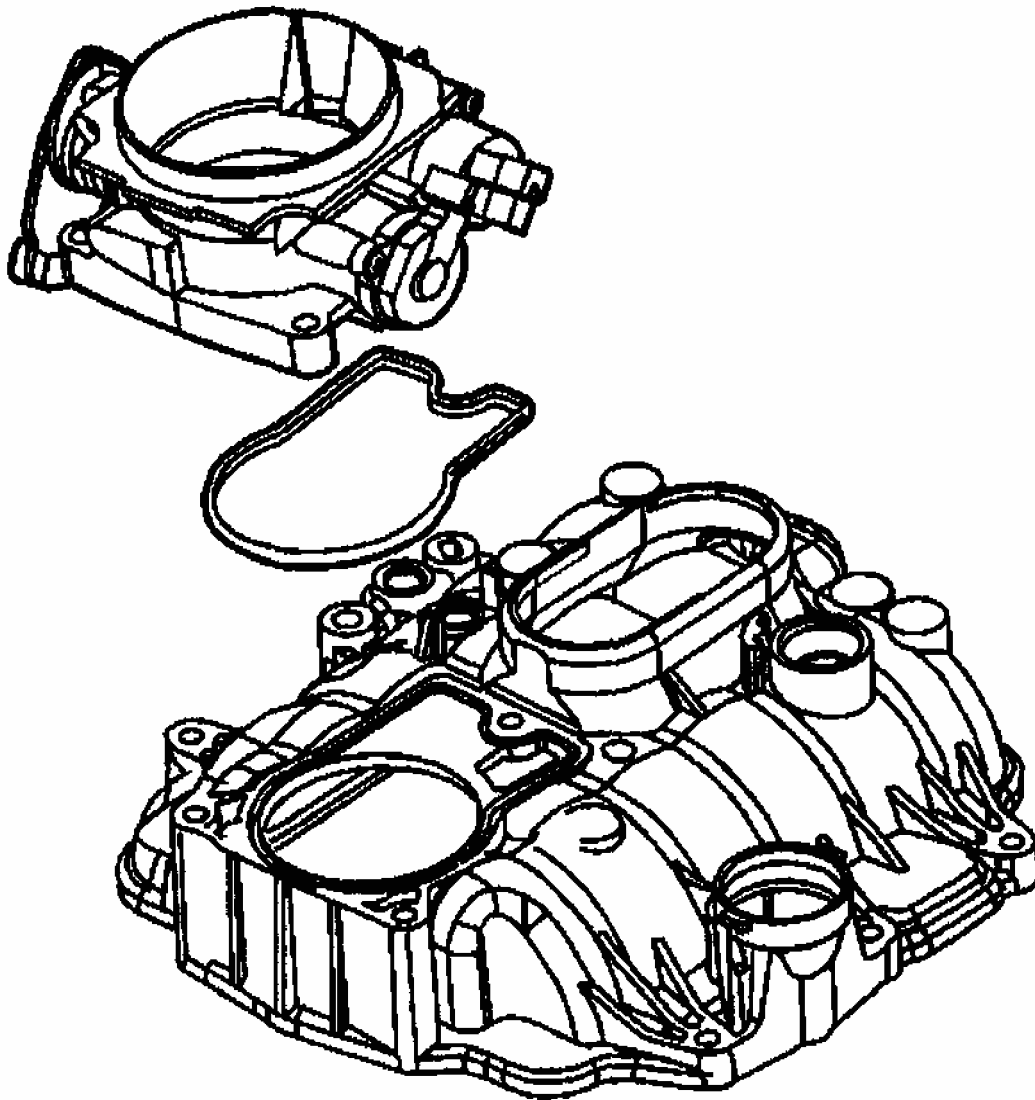
2. Remove the throttle body attaching studs.



G02502975

Fig. 231: Throttle Body Attaching Studs
Courtesy of GENERAL MOTORS CORP.

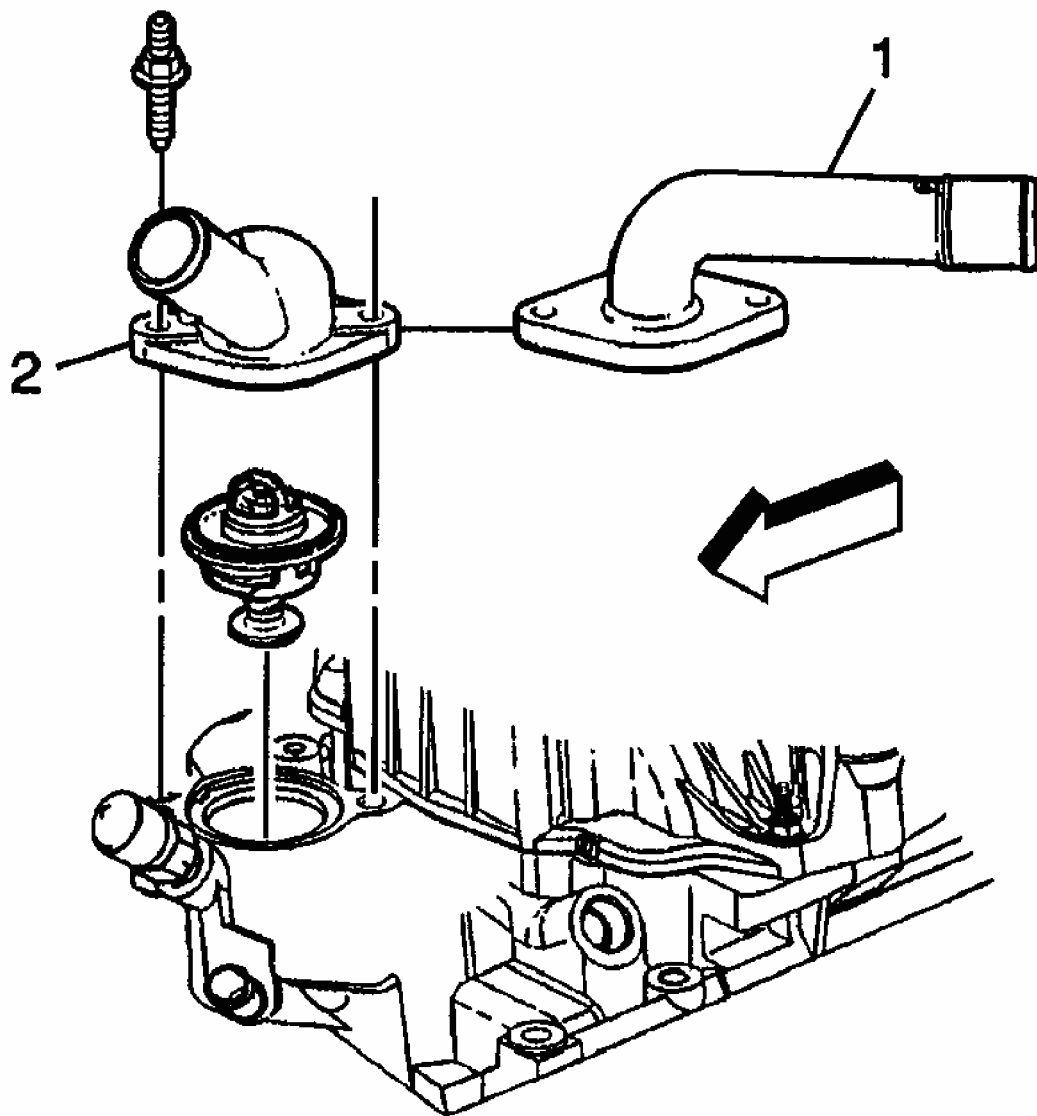
3. Remove the throttle body.
4. Remove the throttle body to upper intake manifold gasket.
5. Discard the throttle body to upper intake manifold gasket.



G02502976

Fig. 232: Throttle Body-To-Upper Intake Manifold Gasket
Courtesy of GENERAL MOTORS CORP.

6. Remove the water outlet studs.
7. Remove the water outlet (1 or 2).
8. Remove the engine coolant thermostat.

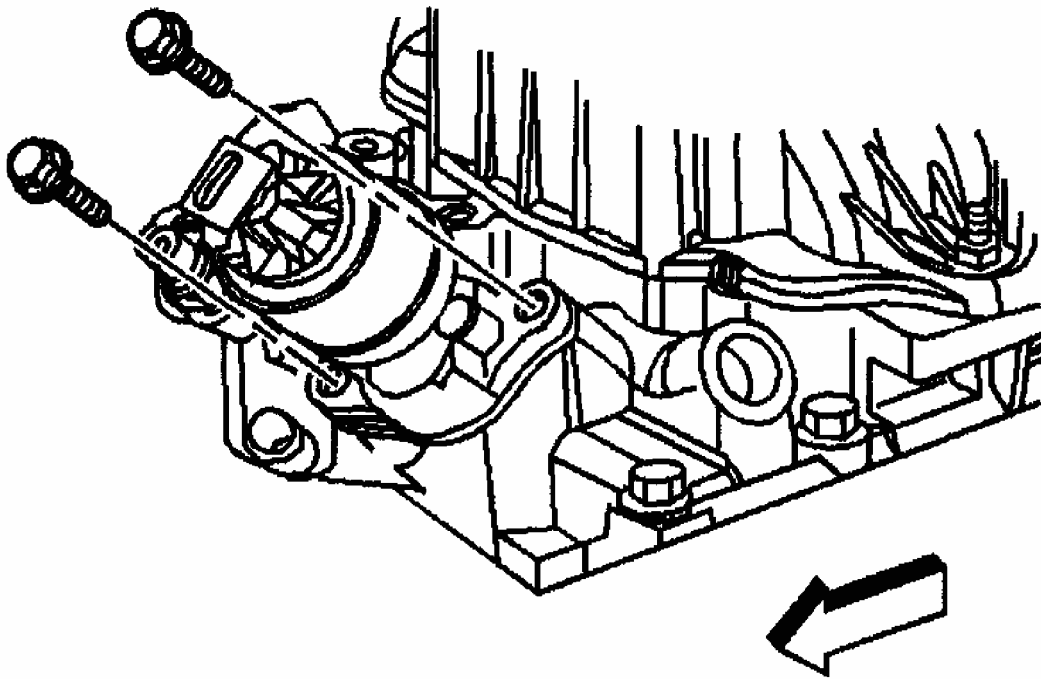


G02502977

Fig. 233: Engine Coolant Thermostat
Courtesy of GENERAL MOTORS CORP.

Important: Note the position and direction of the exhaust gas recirculation (EGR) valve before removal. It is possible to improperly install the EGR valve 180 degrees from the original position.

9. Remove the exhaust gas recirculation (EGR) valve bolts. Some applications will not have an EGR valve.



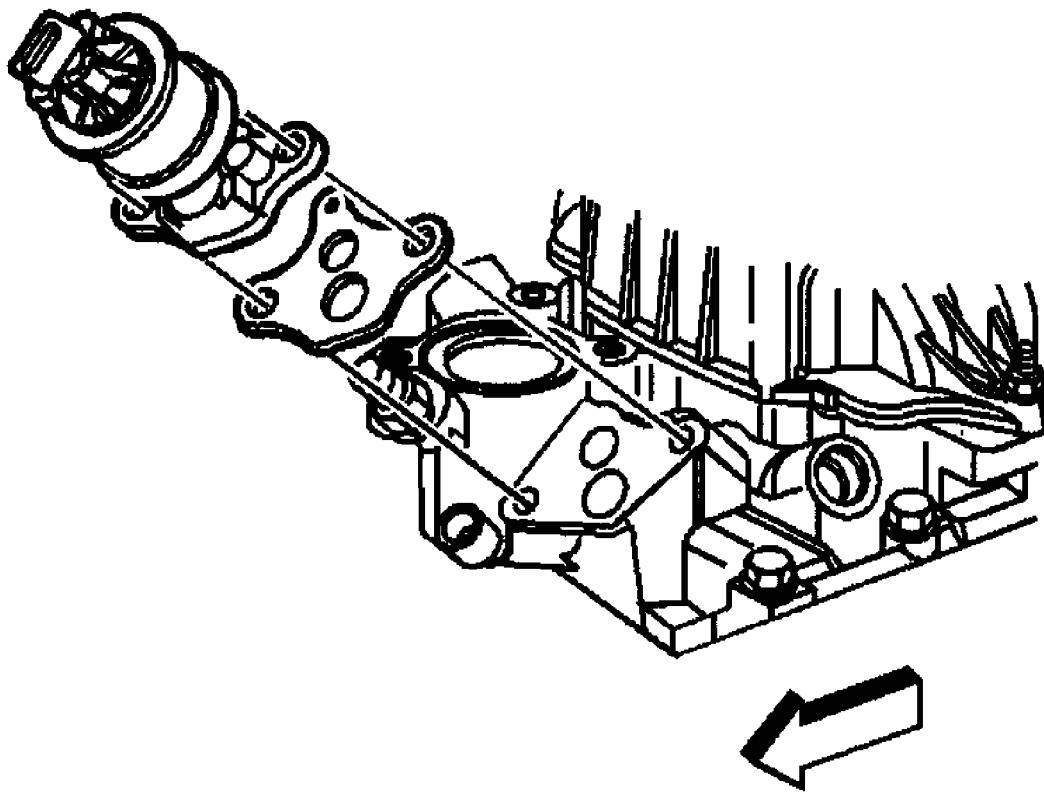
G02502978

Fig. 234: EGR Valve

Courtesy of GENERAL MOTORS CORP.

NOTE: The Linear EGR valve is an electrical component. DO NOT soak in any liquid cleaner or solvent because damage may result.

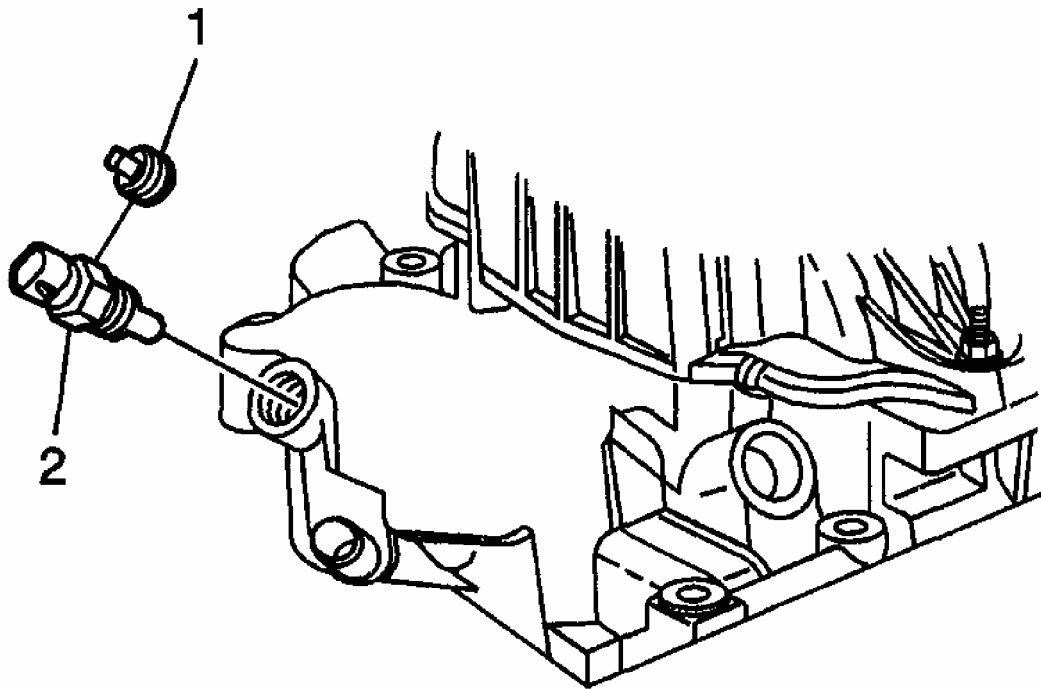
10. Remove the EGR valve and the EGR valve gasket from the lower intake manifold.
11. Discard the EGR valve gasket.



G02502979

Fig. 235: EGR Valve Gasket
Courtesy of GENERAL MOTORS CORP.

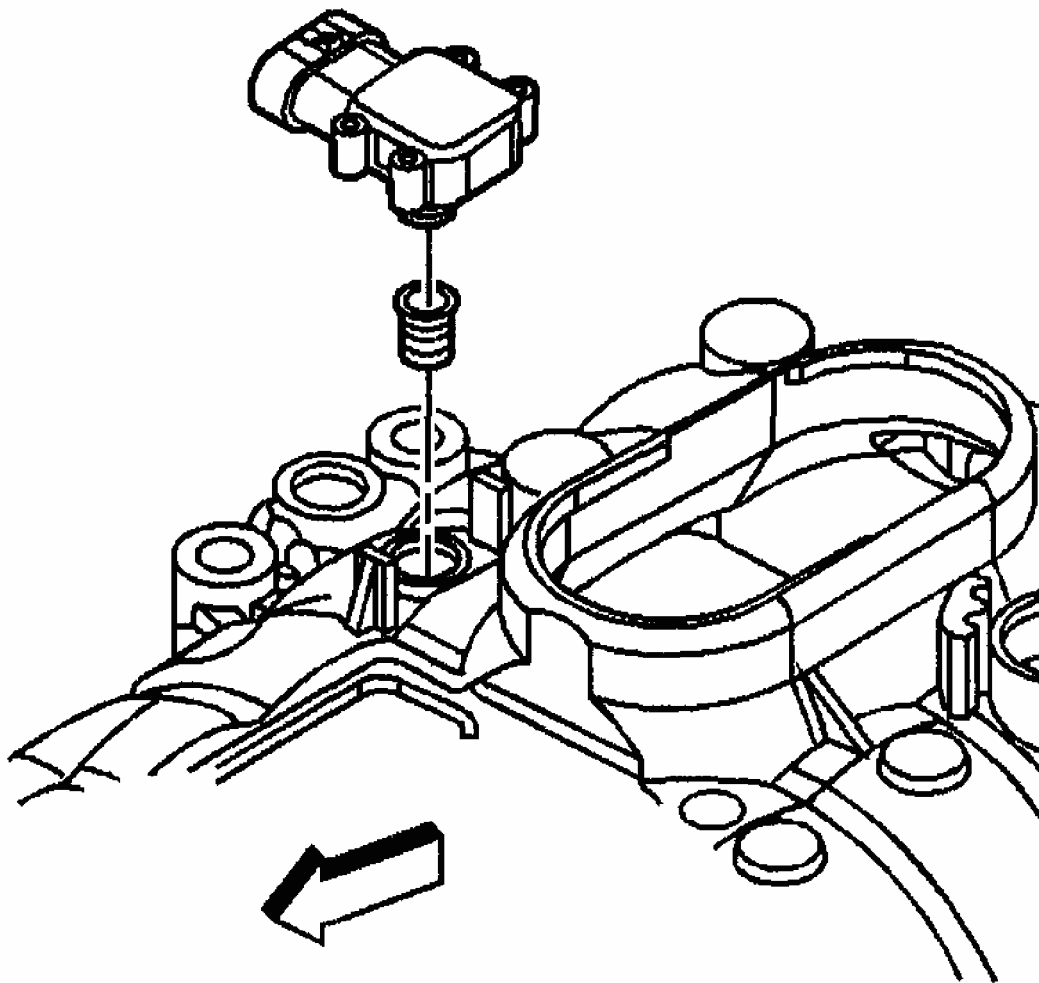
12. Remove the engine coolant temperature (ECT) sensor plug (1) or the ECT sensor (2) from the front of the lower intake manifold, if equipped.



G02502980

Fig. 236: ECT Sensor Plug Or ECT Sensor
Courtesy of GENERAL MOTORS CORP.

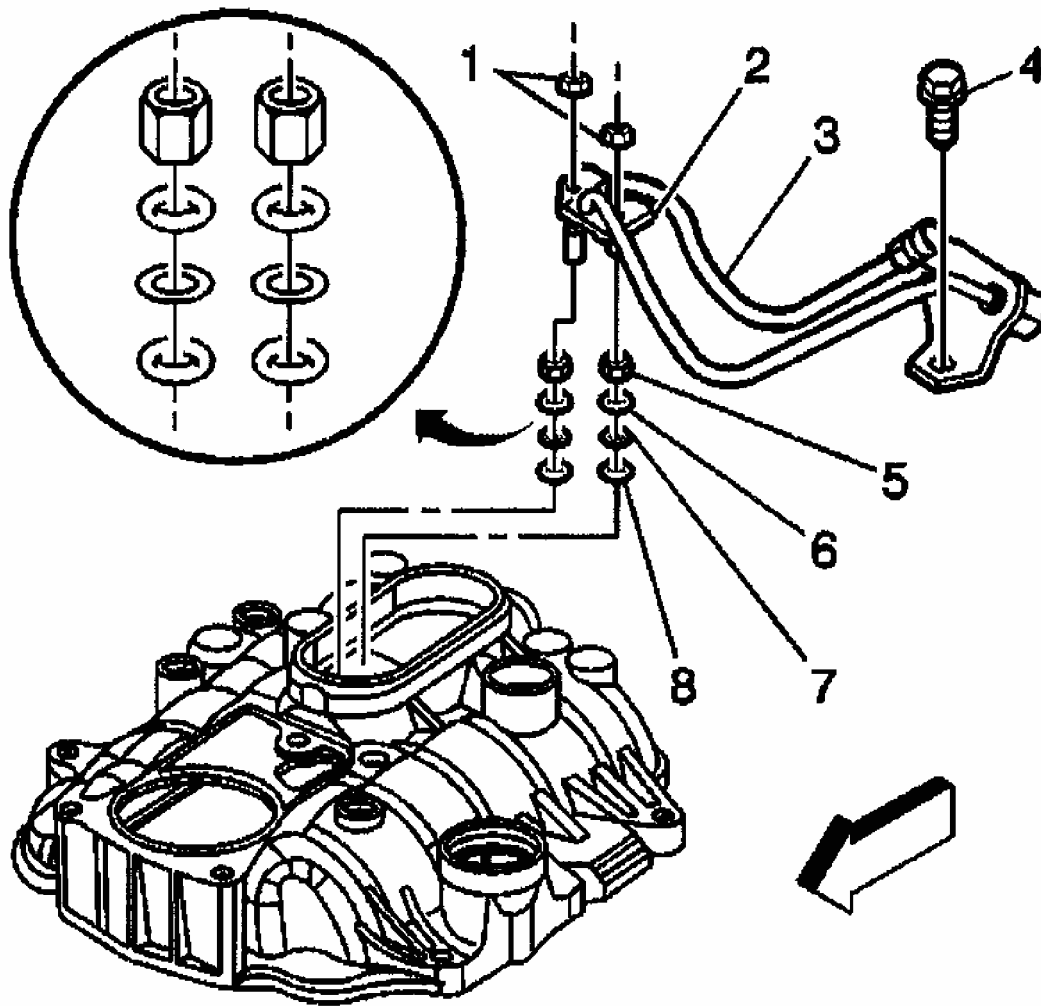
13. Remove the studs and the ignition coil.
14. Remove the manifold absolute pressure (MAP) sensor.
15. Remove the MAP sensor seal from the MAP sensor.
16. Discard the MAP sensor seal.



G02502982

Fig. 237: MAP Sensor
Courtesy of GENERAL MOTORS CORP.

17. Remove the fuel pipe bolt (4).
18. Remove the fuel pipe retainer nuts (1).
19. Remove the fuel pipe retainer (2).
20. Remove the fuel pipe (3).
21. Remove and discard the fuel seal retainers (5).
22. Remove and discard the fuel seals (6), yellow O-rings.
23. Remove and discard the spacer rings (7), flat washers.
24. Remove and discard the fuel seals (8), black O-rings.

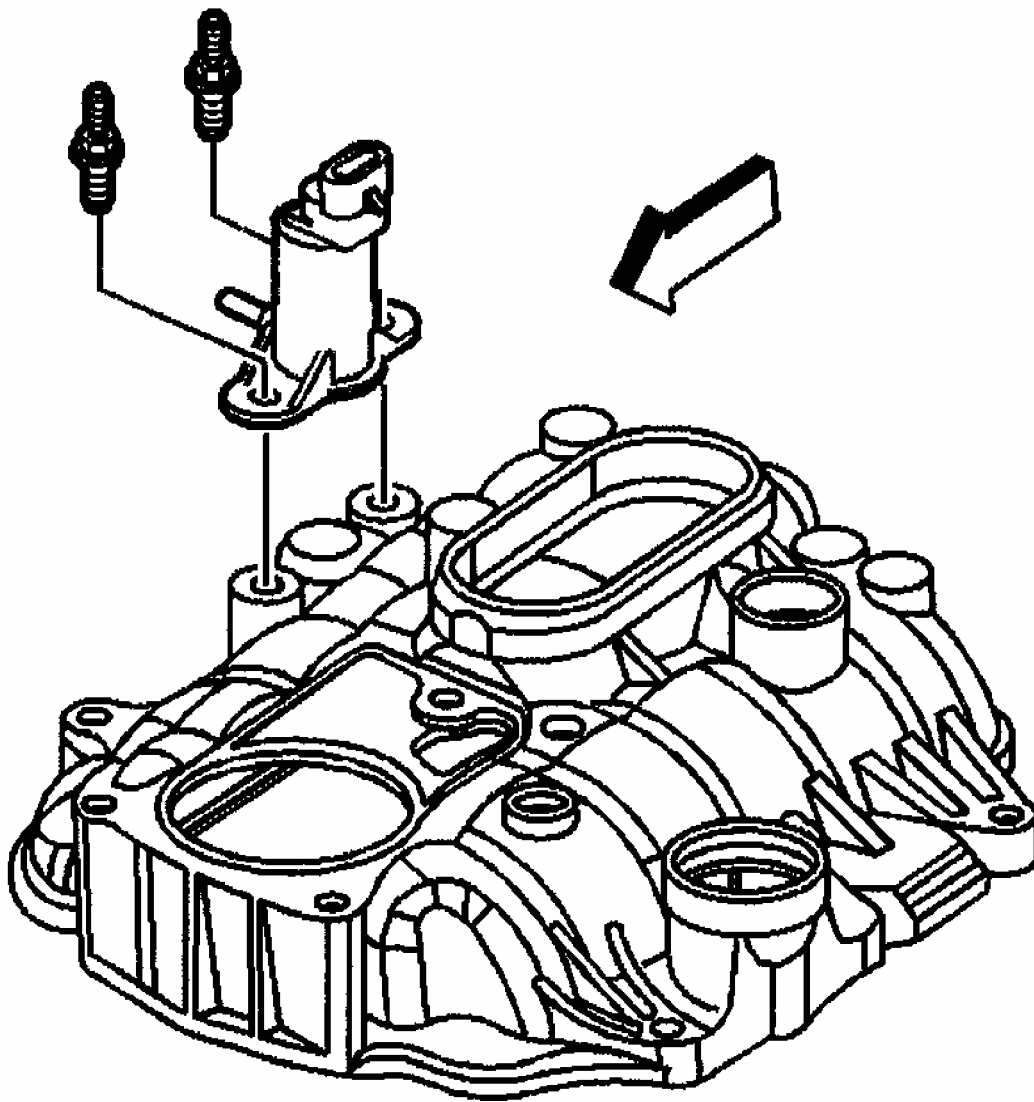


G02502983

Fig. 238: Fuel Pipe Seals

Courtesy of GENERAL MOTORS CORP.

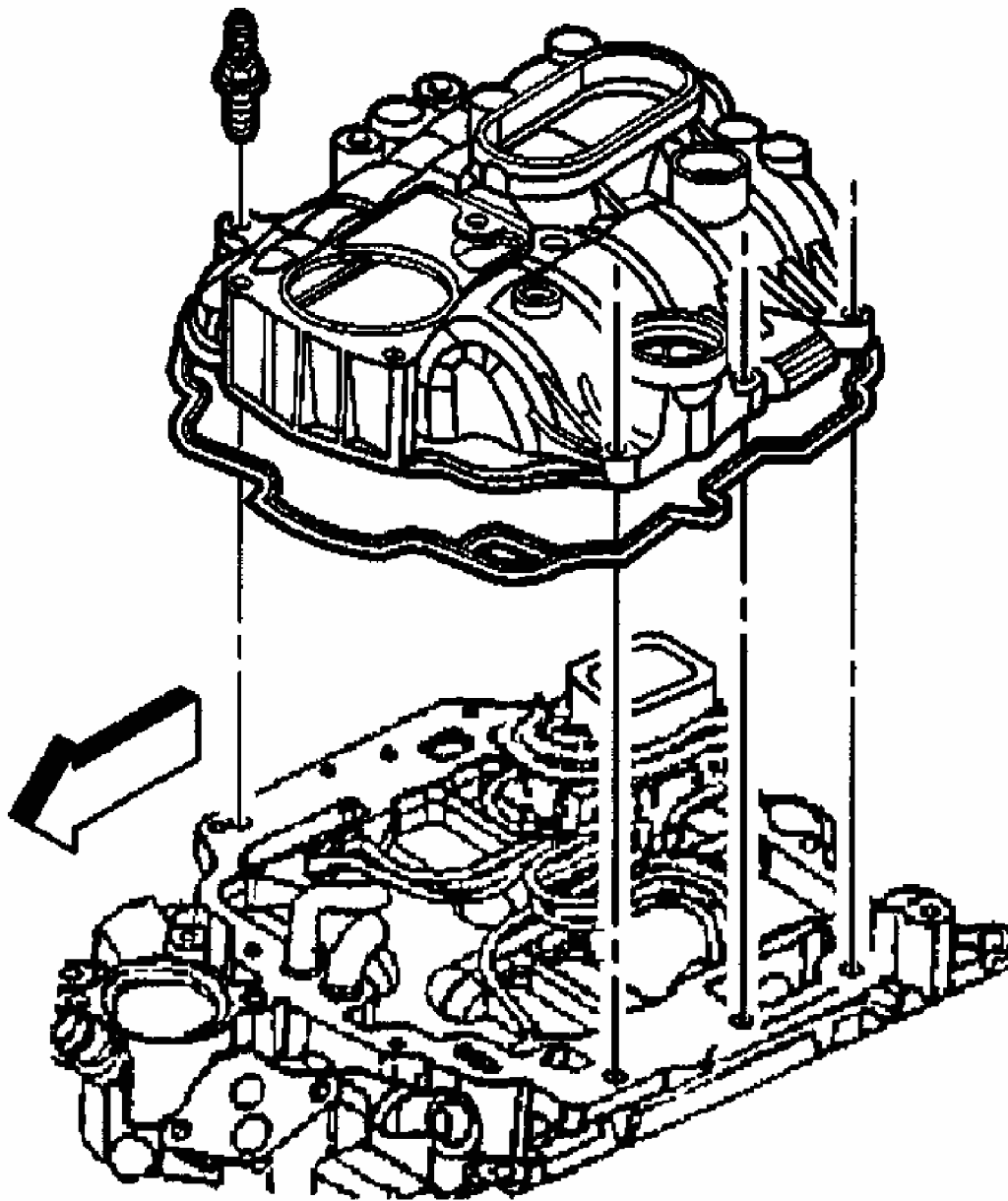
25. Remove the studs and the evaporative emission (EVAP) canister purge solenoid valve.



G02502984

Fig. 239: EVAP Canister Purge Solenoid Valve
Courtesy of GENERAL MOTORS CORP.

26. Remove the nut and the engine wiring harness bracket.
27. Remove the upper intake manifold attaching studs.
28. Remove the upper intake manifold.
29. Remove the upper intake manifold to lower intake manifold gasket.
30. Discard the upper intake manifold to lower intake manifold gasket.



G02502985

Fig. 240: Upper Intake Manifold-To-Lower Intake Manifold Gasket
Courtesy of GENERAL MOTORS CORP.

31. Remove the fuel meter body seal and discard.

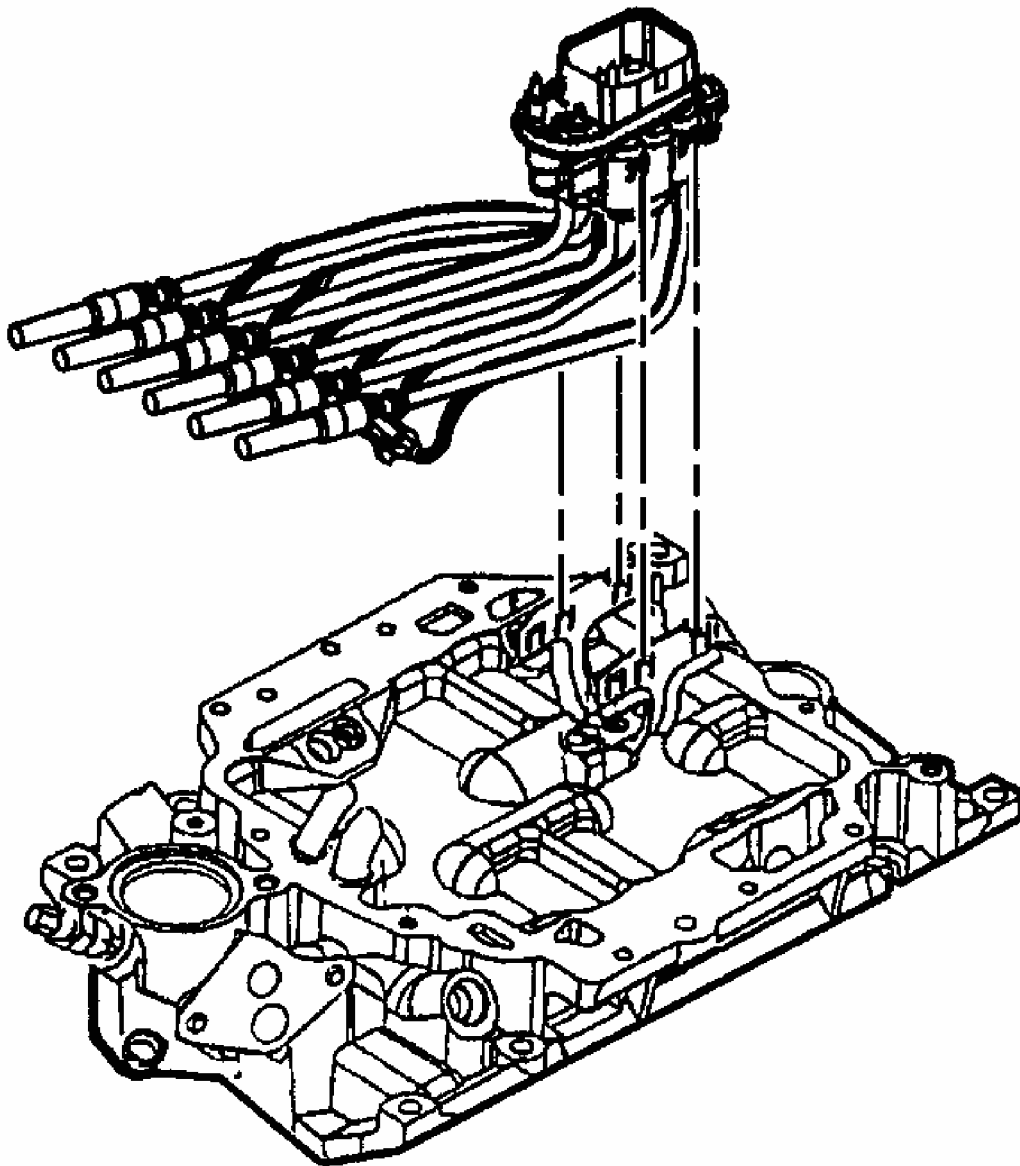
Important: The injectors may require increased effort when removing.

32. Remove the 6 injectors from the lower intake manifold bores.

33. Remove the fuel meter body.

Important: Discard the old fuel meter body bracket and install a new bracket when converting from SFI (L35) to MFI (LU3) fuel systems.

34. Remove the bolt and the fuel meter body bracket.

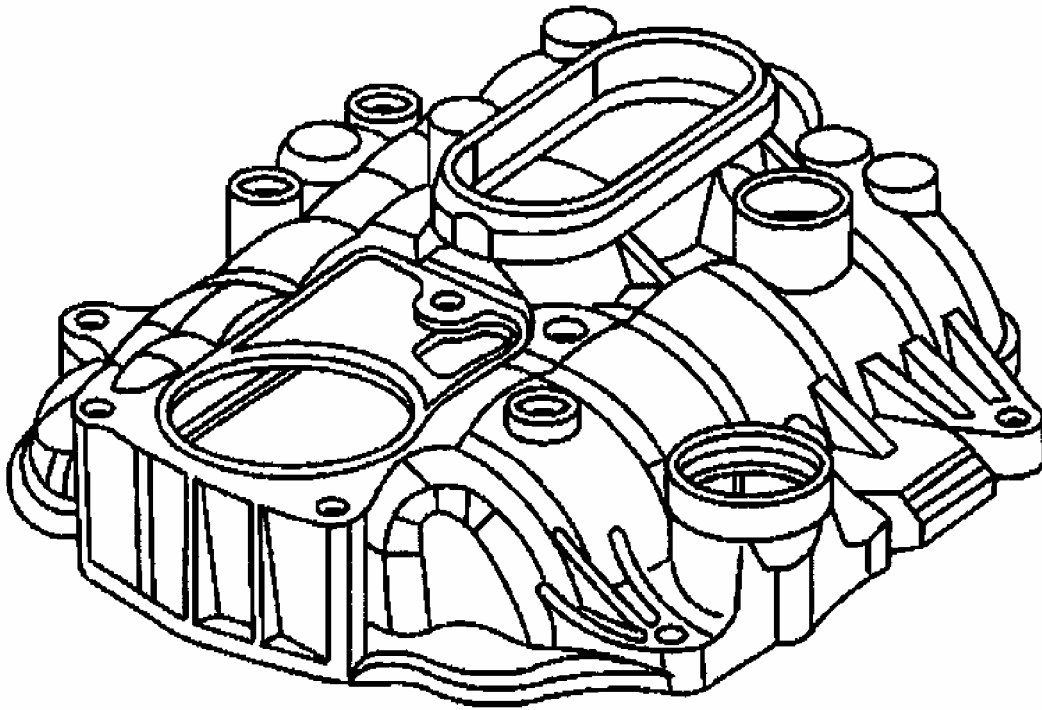


G02502986

Fig. 241: Fuel Meter Body
Courtesy of GENERAL MOTORS CORP.

INTAKE MANIFOLD CLEANING & INSPECTION

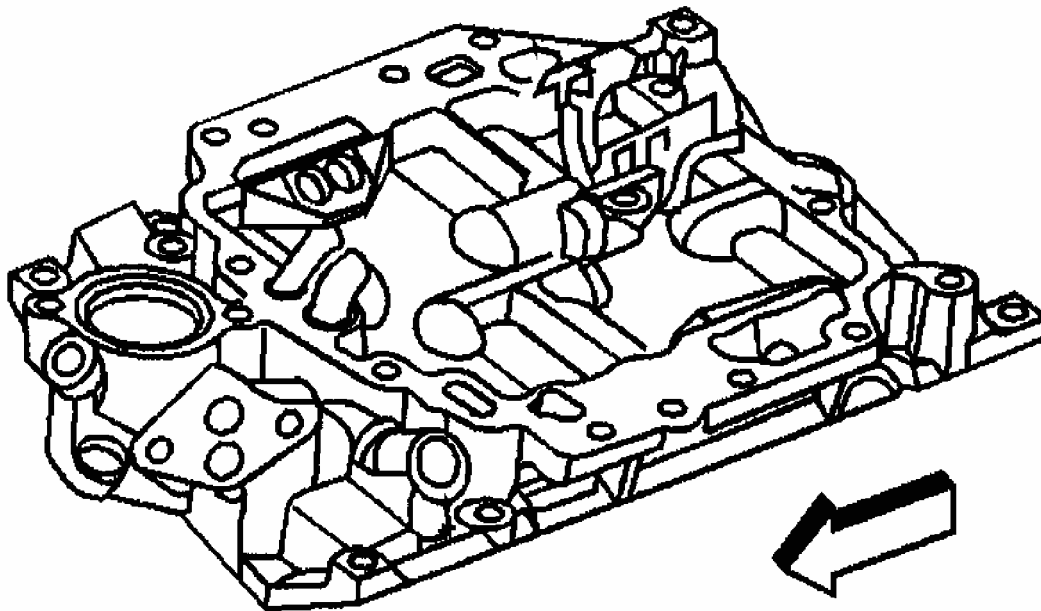
1. Clean the upper intake manifold in cleaning solvent.
2. Dry the upper intake manifold with compressed air.



G02502987

Fig. 242: Upper Intake Manifold
Courtesy of GENERAL MOTORS CORP.

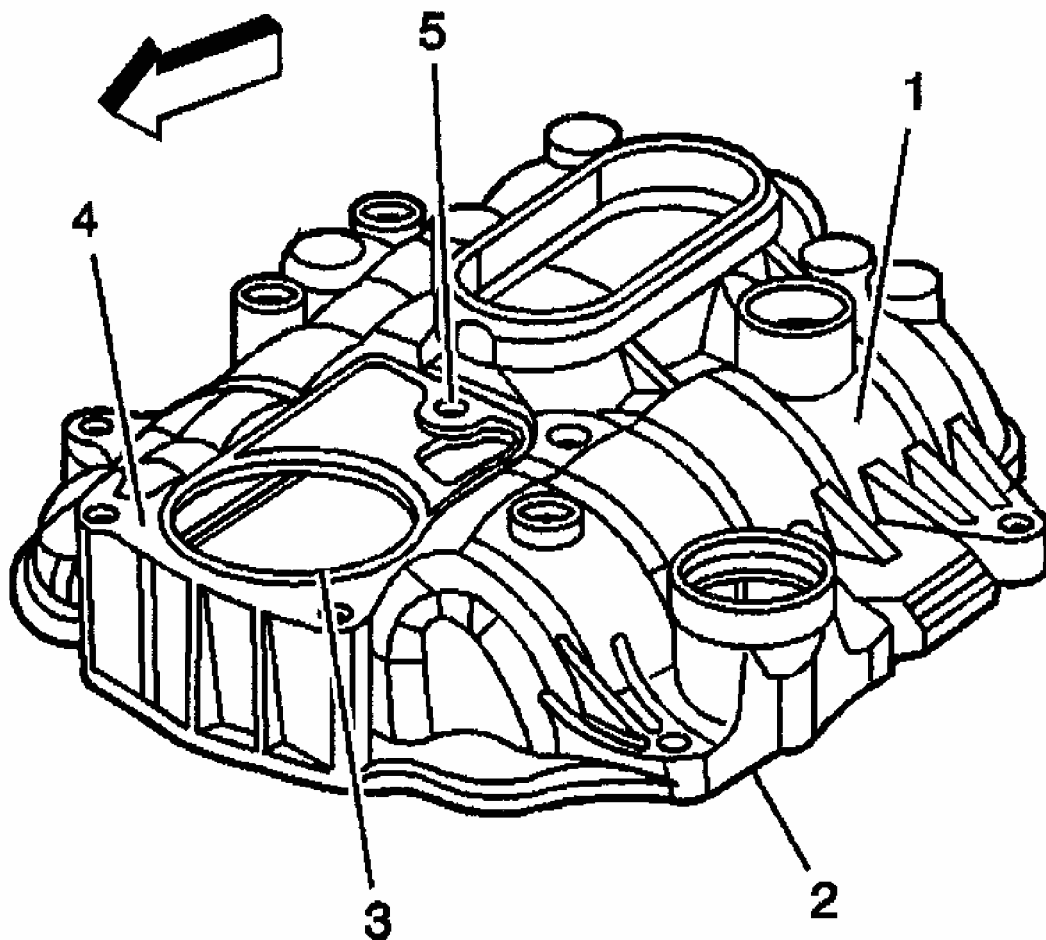
3. Clean the lower intake manifold in cleaning solvent.
4. Dry the lower intake manifold with compressed air.



G02502988

Fig. 243: Lower Intake Manifold
Courtesy of GENERAL MOTORS CORP.

5. Inspect the upper intake manifold for the following:
 - Cracks or other damage to the exterior (1)
 - Cracking or damage in the gasket grooves (2) and (3)
 - Damage to the throttle body mounting surface (4)
 - Loose or damaged bolt hole thread inserts (5)



G02502989

Fig. 244: Inspecting Upper Intake Manifold
Courtesy of GENERAL MOTORS CORP.

6. Inspect the lower intake manifold for the following:
- Damage to the gasket sealing surfaces (1), (2) and (3)
 - Restricted exhaust gas recirculation (EGR) system passages (4)
 - Restricted cooling system passages (5)
 - Cracks or damage
 - Damage to the threaded bolt holes

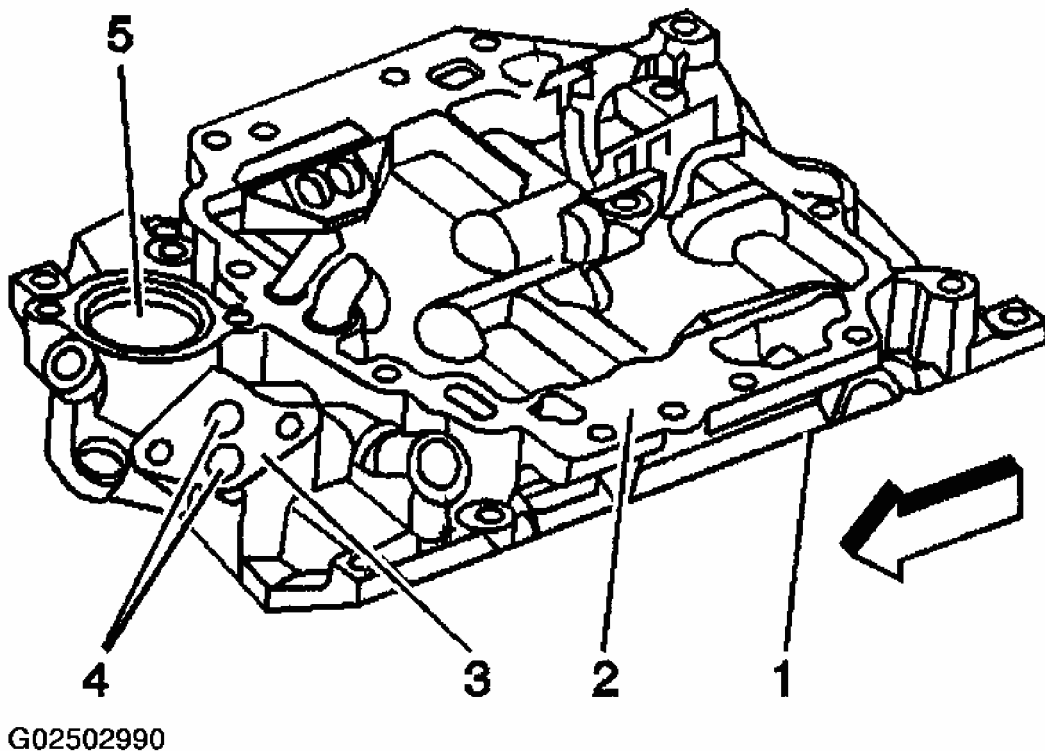
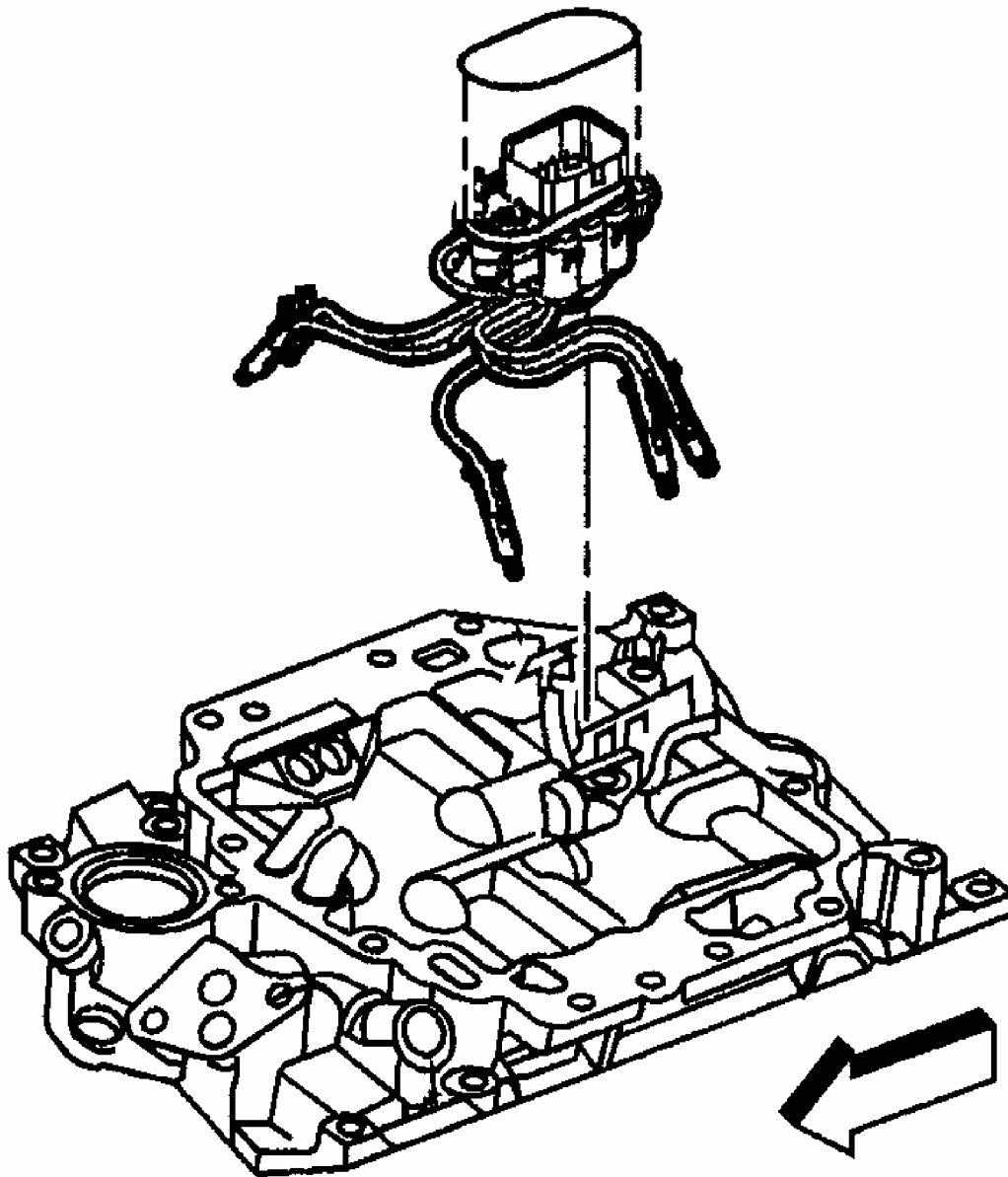


Fig. 245: Inspecting Lower Intake Manifold
Courtesy of GENERAL MOTORS CORP.

INTAKE MANIFOLD ASSEMBLY (L35)

1. If reusing the fastener, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the fuel meter body bracket bolt.
2. Install the fuel meter body bracket and bolt. Tighten the fuel meter bracket bolt to 10 N.m (89 lb in).
3. Install the fuel meter body into the fuel meter body bracket.
4. Install the 6 poppet nozzles into the proper lower intake manifold bores.



G02502991

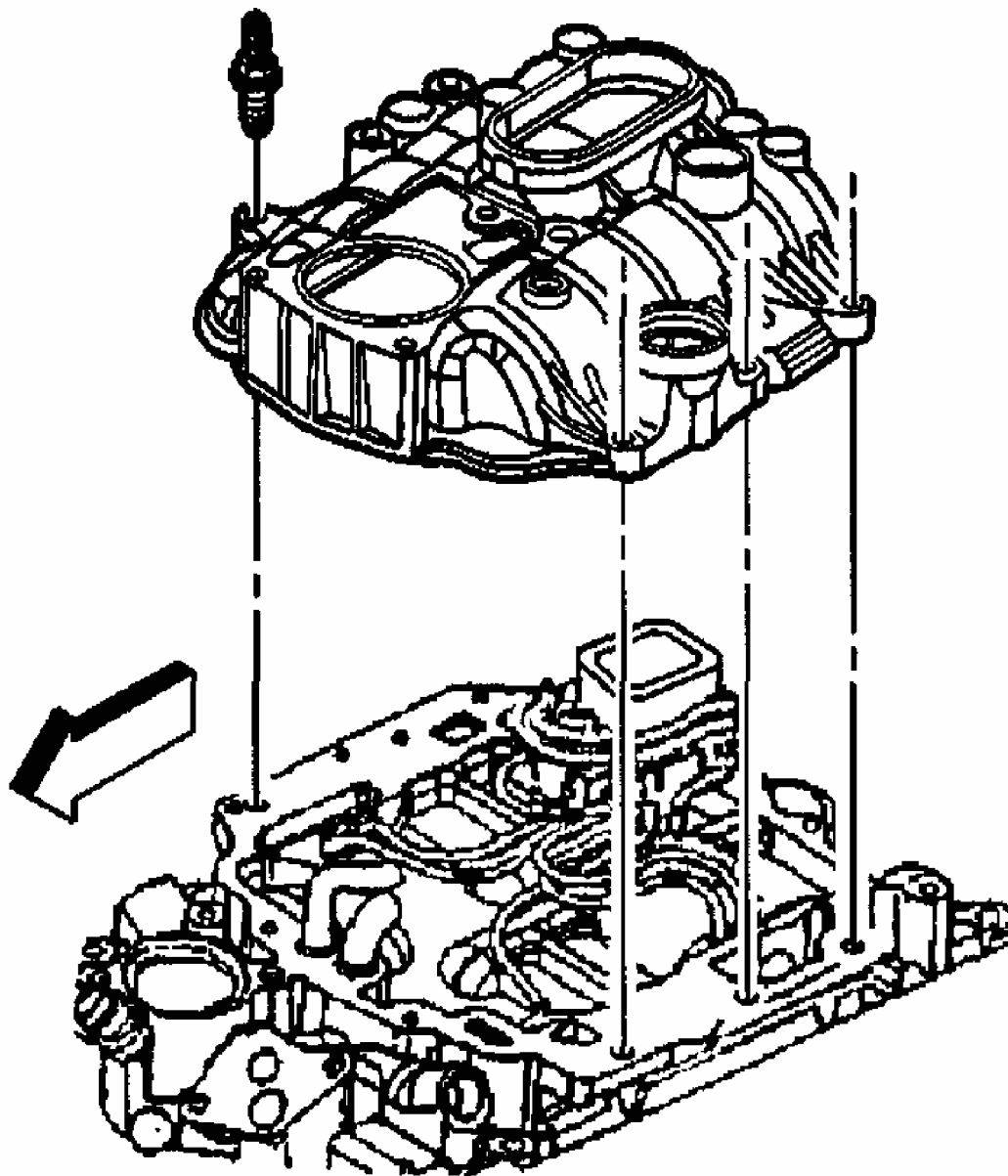
Fig. 246: Poppet Nozzles
Courtesy of GENERAL MOTORS CORP.

5. Inspect the poppet nozzles in order to ensure that the poppet nozzles are firmly seated and locked in the lower intake manifold bores.
6. Install a NEW fuel meter body seal into the groove of the fuel meter body.
7. Install a NEW upper intake manifold to lower intake manifold gasket into the groove of the upper intake manifold.

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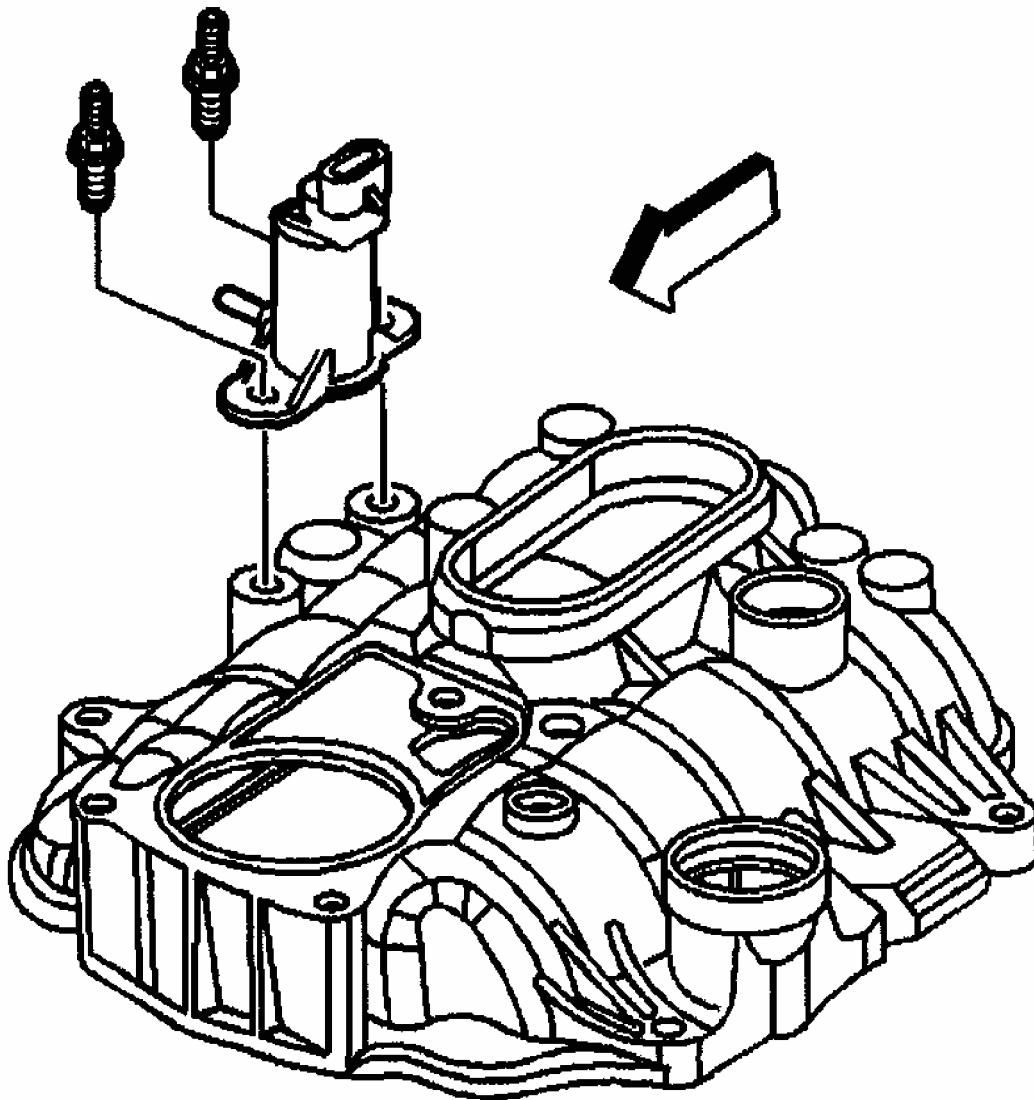
8. Install the upper intake manifold onto the lower intake manifold.
9. If reusing the fasteners, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the upper intake manifold attaching studs.
10. Install the upper intake manifold attaching studs.
 - 10.1. Tighten the upper intake manifold attaching studs on the first pass to 5 N.m (44 lb in).
 - 10.2. Tighten the upper intake manifold attaching studs on the final pass to 9 N.m (80 lb in).



G02502992

Fig. 247: Upper Intake Manifold
Courtesy of GENERAL MOTORS CORP.

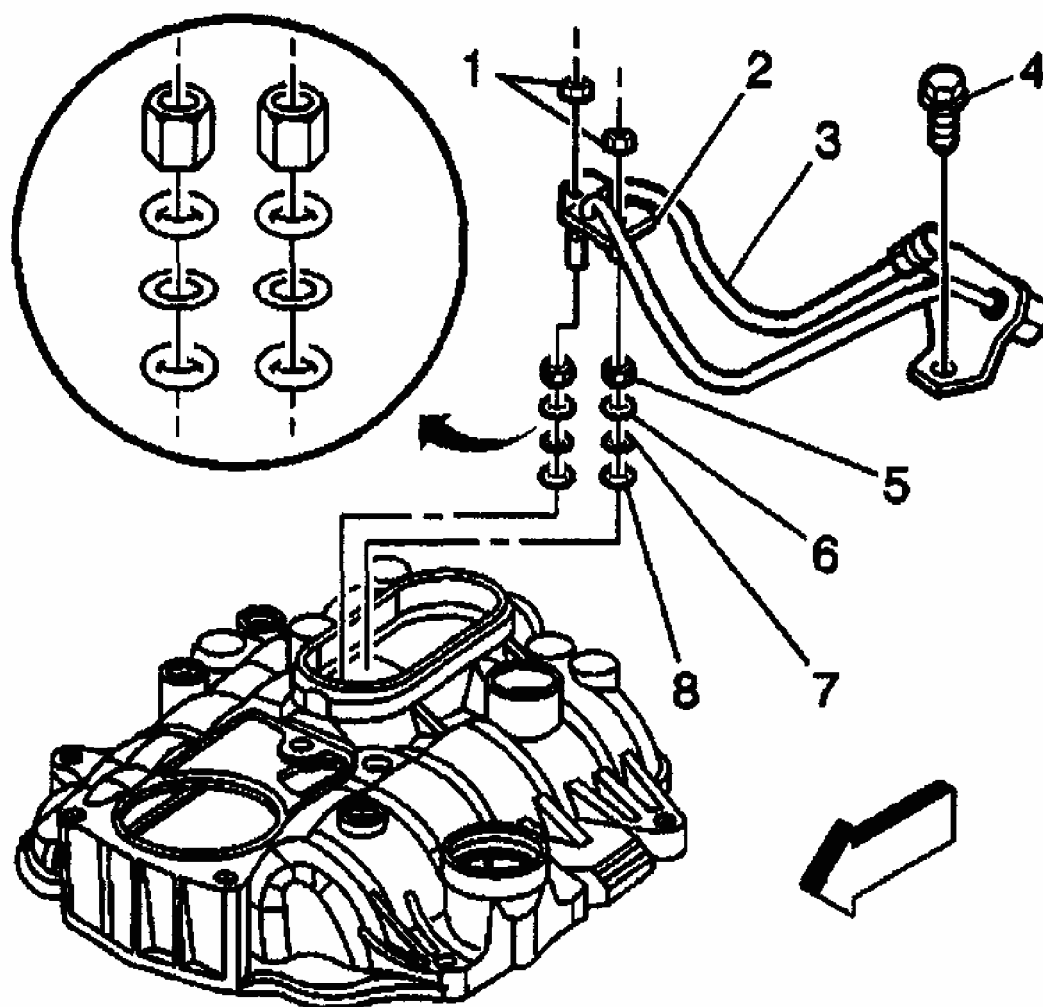
11. If reusing the fasteners, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the evaporative emission (EVAP) canister purge solenoid valve studs.
12. Install the EVAP canister purge solenoid valve and studs. Tighten the EVAP canister purge solenoid valve studs to 10 N.m (89 lb in).



G02502993

Fig. 248: EVAP Canister Purge Solenoid
Courtesy of GENERAL MOTORS CORP.

13. Install the engine wiring harness bracket and nut. Tighten the engine wiring harness bracket nut to 12 N.m (106 lb in).
14. Install the NEW fuel seals (8), black O-rings, into the fuel meter body.

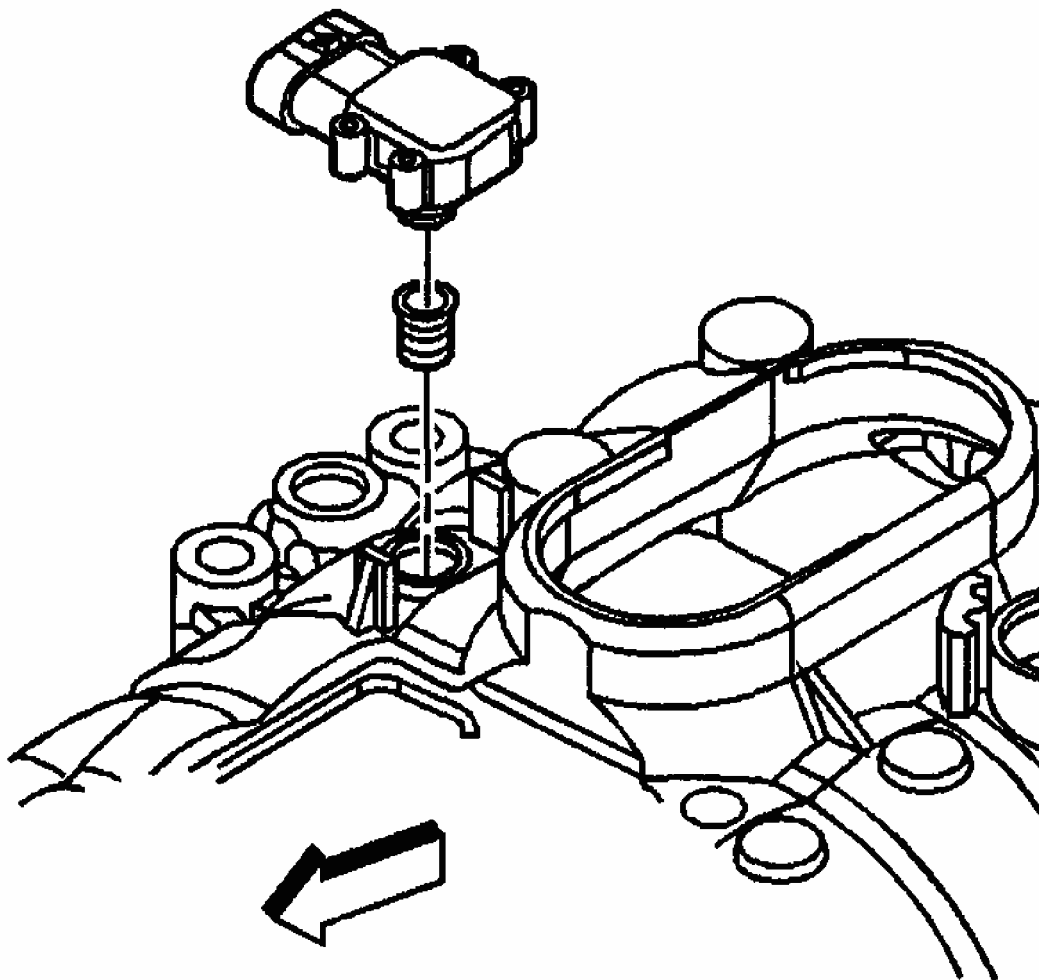


G02502994

Fig. 249: Fuel Meter Body Seals
Courtesy of GENERAL MOTORS CORP.

15. Install the NEW spacer rings (7), flat washers, into the fuel meter body.
16. Install the NEW fuel seals (6), yellow O-rings, into the fuel meter body.
17. Install the NEW fuel seal retainers (5) into the fuel meter body.
18. Install the fuel pipe (3) into the fuel meter body.
19. Install the fuel pipe retainer bracket (2) onto the fuel pipe.
20. Install the fuel pipe retainer bracket nuts (1).
21. If reusing the fastener, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the fuel pipe bolt.
22. Install the fuel pipe bolt (4).

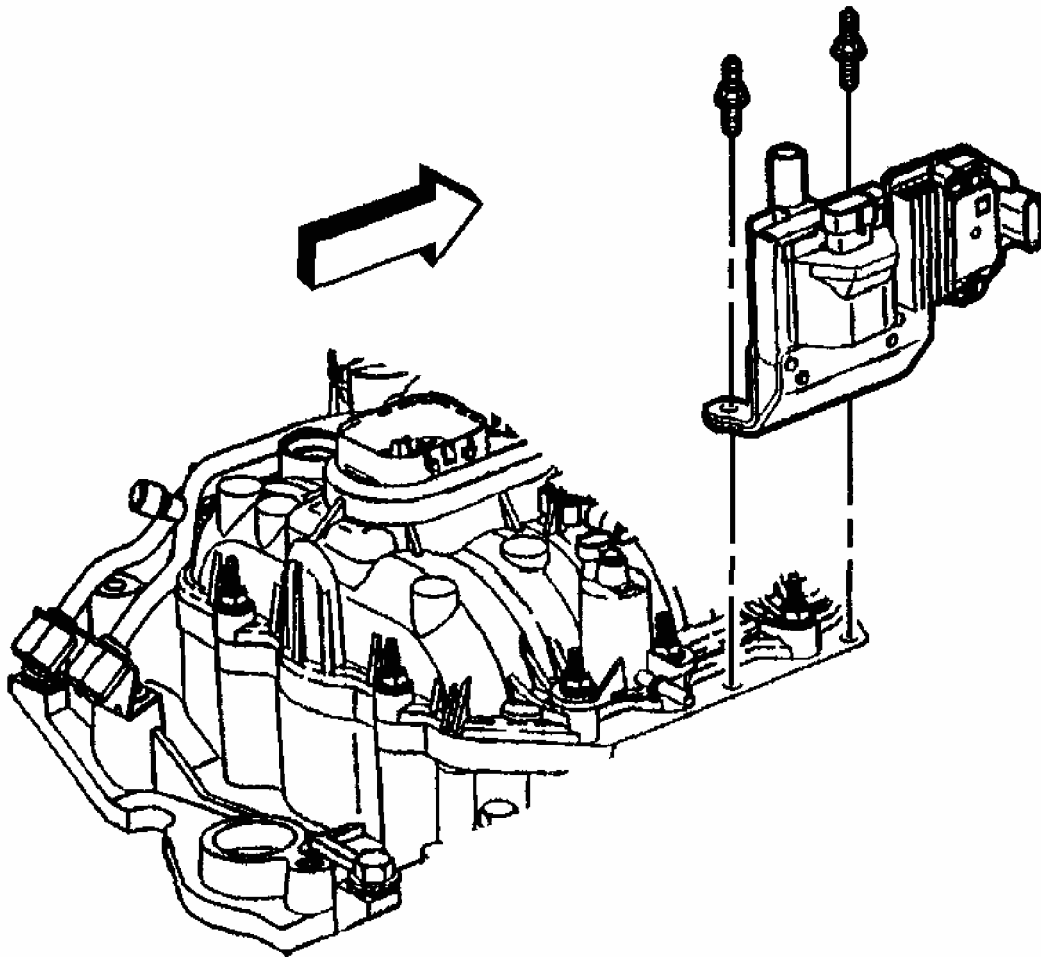
- 22.1. Tighten the fuel pipe bracket nuts to 3 N.m (27 lb in).
- 22.2. Tighten the fuel pipe bolt to 6 N.m (53 lb in).
- 23. Install a NEW manifold absolute pressure (MAP) sensor seal onto the MAP sensor.
- 24. Apply a small amount, approximately 1 drop, of clean engine oil to the MAP sensor seal.
- 25. Install the MAP sensor into the upper intake manifold.



G02502995

Fig. 250: MAP Sensor
Courtesy of GENERAL MOTORS CORP.

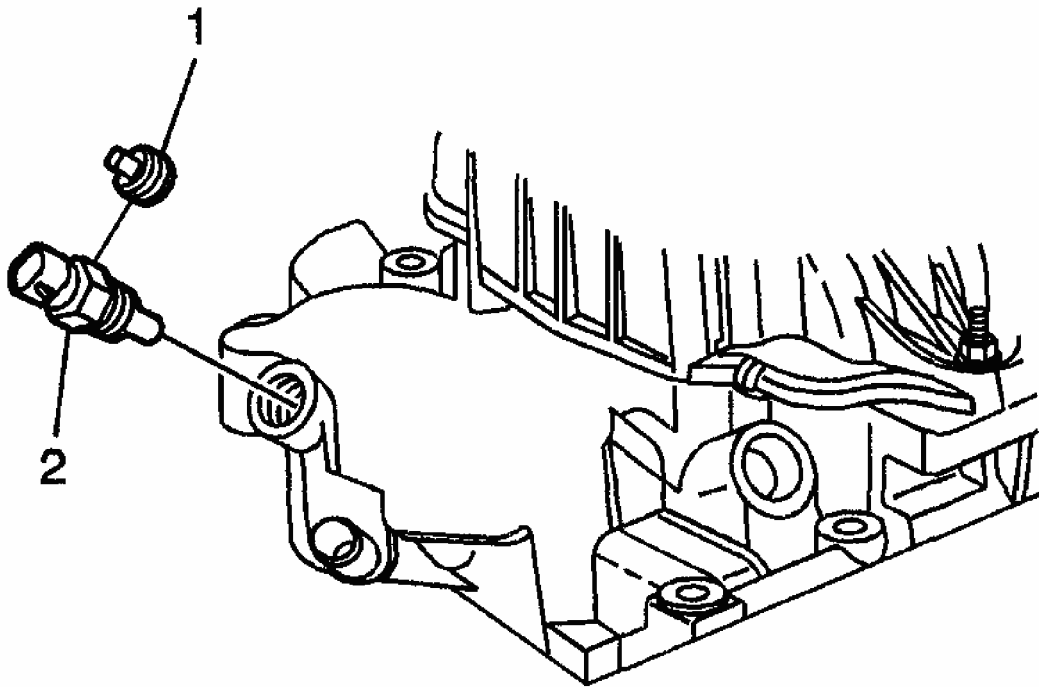
- 26. Install the ignition coil and studs. Tighten the ignition coil studs to 12 N.m (106 lb in).



G02502996

Fig. 251: Ignition Coil & Studs
Courtesy of GENERAL MOTORS CORP.

27. If reusing the engine coolant temperature (ECT) sensor plug (1) or the ECT sensor (2), if equipped, apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the ECT sensor plug (1) or the ECT sensor (2).



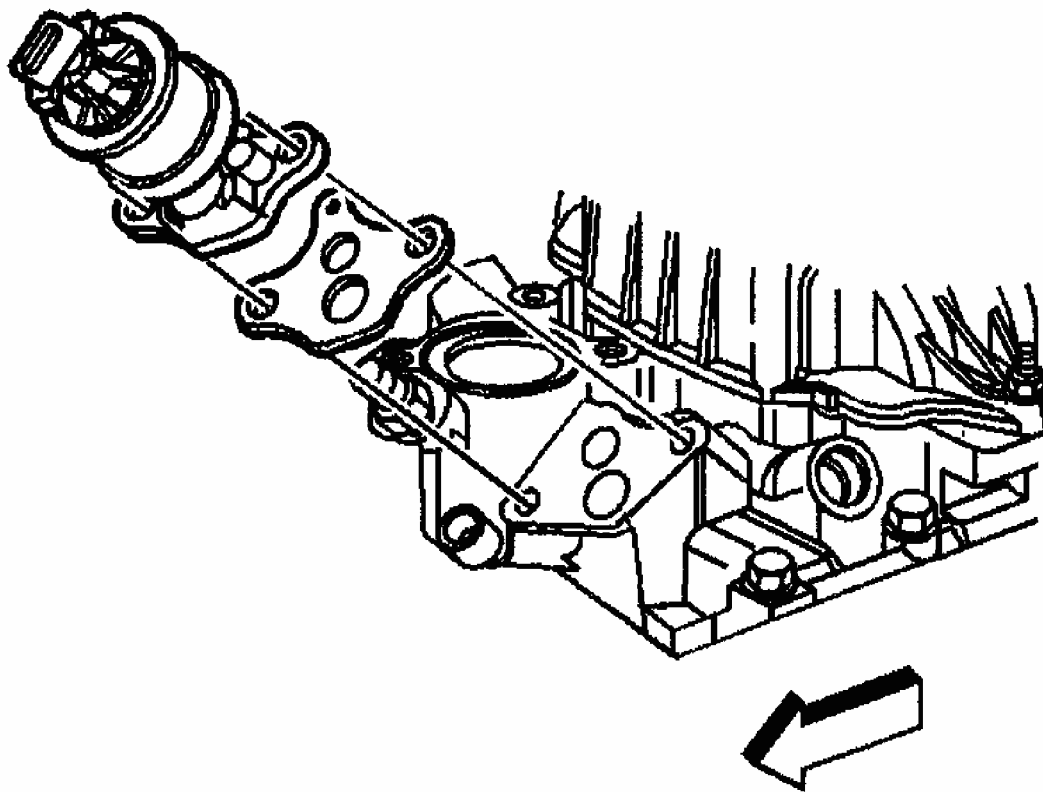
G02502997

Fig. 252: ECT Sensor Plug Or ECT Sensor
Courtesy of GENERAL MOTORS CORP.

28. Install the ECT sensor or plug, if equipped, into the front of the lower intake manifold. Tighten the ECT sensor or plug to 20 N.m (15 lb ft).

Important: The exhaust gas recirculation (EGR) valve must be installed in the original orientation. Some applications will not have an EGR valve.

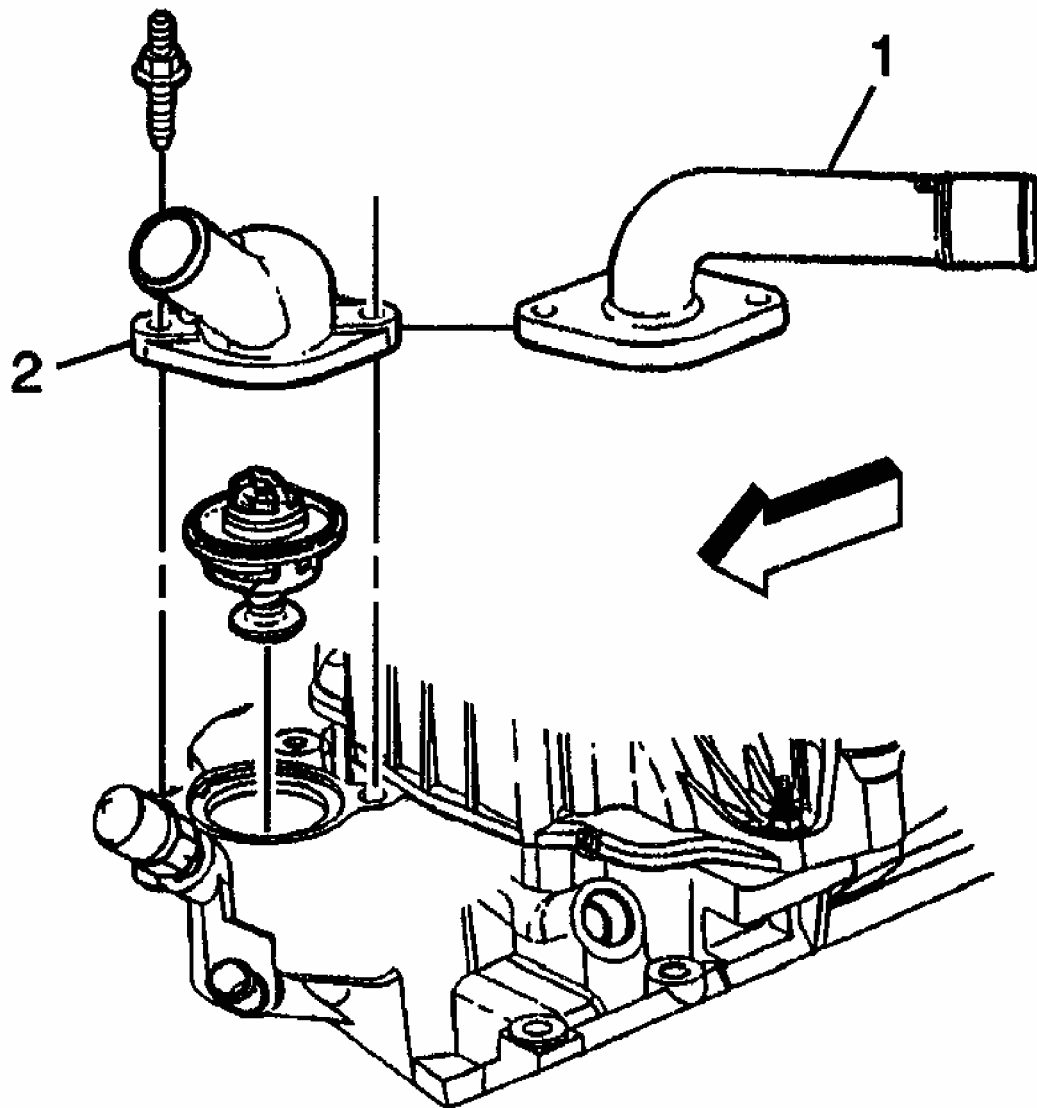
29. Install a NEW EGR valve gasket and the EGR valve.



G02502998

Fig. 253: EGR Valve & Gasket
Courtesy of GENERAL MOTORS CORP.

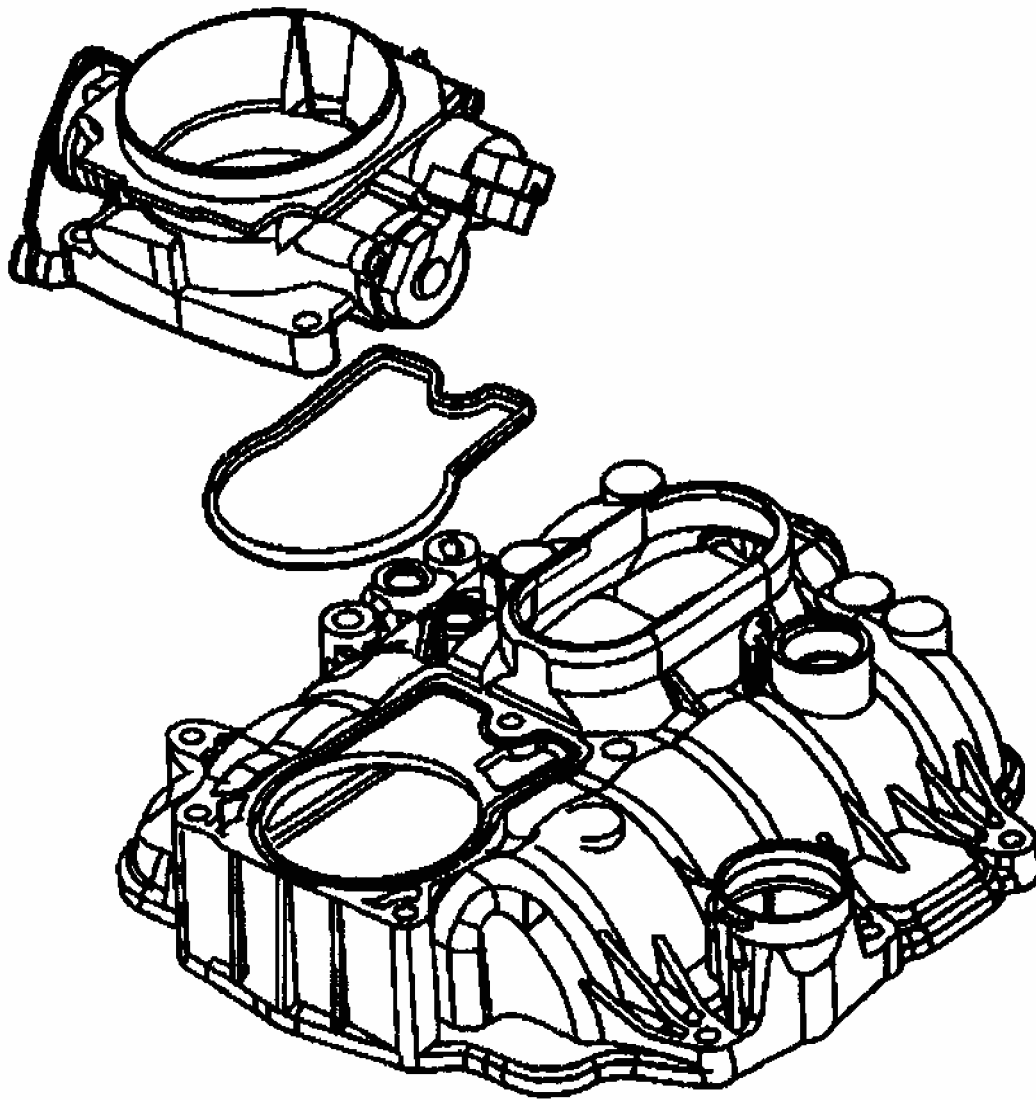
30. Install the EGR valve bolts.
 - 30.1. Tighten the EGR valve bolts on the first pass to 7 N.m (62 lb in).
 - 30.2. Tighten the EGR valve bolts on the final pass to 30 N.m (22 Lb ft).
31. Install the engine coolant thermostat.
32. Install the water outlet (1 or 2).
33. Install the water outlet studs. Tighten the water outlet studs to 25 N.m (18 Lb ft).



G02503000

Fig. 254: Engine Coolant Thermostat & Water Outlet
Courtesy of GENERAL MOTORS CORP.

34. Install a NEW throttle body gasket into the groove in the upper intake manifold.
35. Install the throttle body onto the upper intake manifold.



G02503001

Fig. 255: Throttle Body & Upper Intake Manifold
Courtesy of GENERAL MOTORS CORP.

36. If reusing the fasteners, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the throttle body attaching studs.
37. Install the throttle body attaching studs. Tighten the throttle body attaching studs to 9 N.m (80 lb in).
38. Install the accelerator control cable bracket, the studs, and the nuts.
 - 38.1. Tighten the accelerator control cable bracket stud to the intake manifold to 6 N.m (53 lb in).
 - 38.2. Tighten the accelerator control cable bracket nuts to 12 N.m (106 lb in).

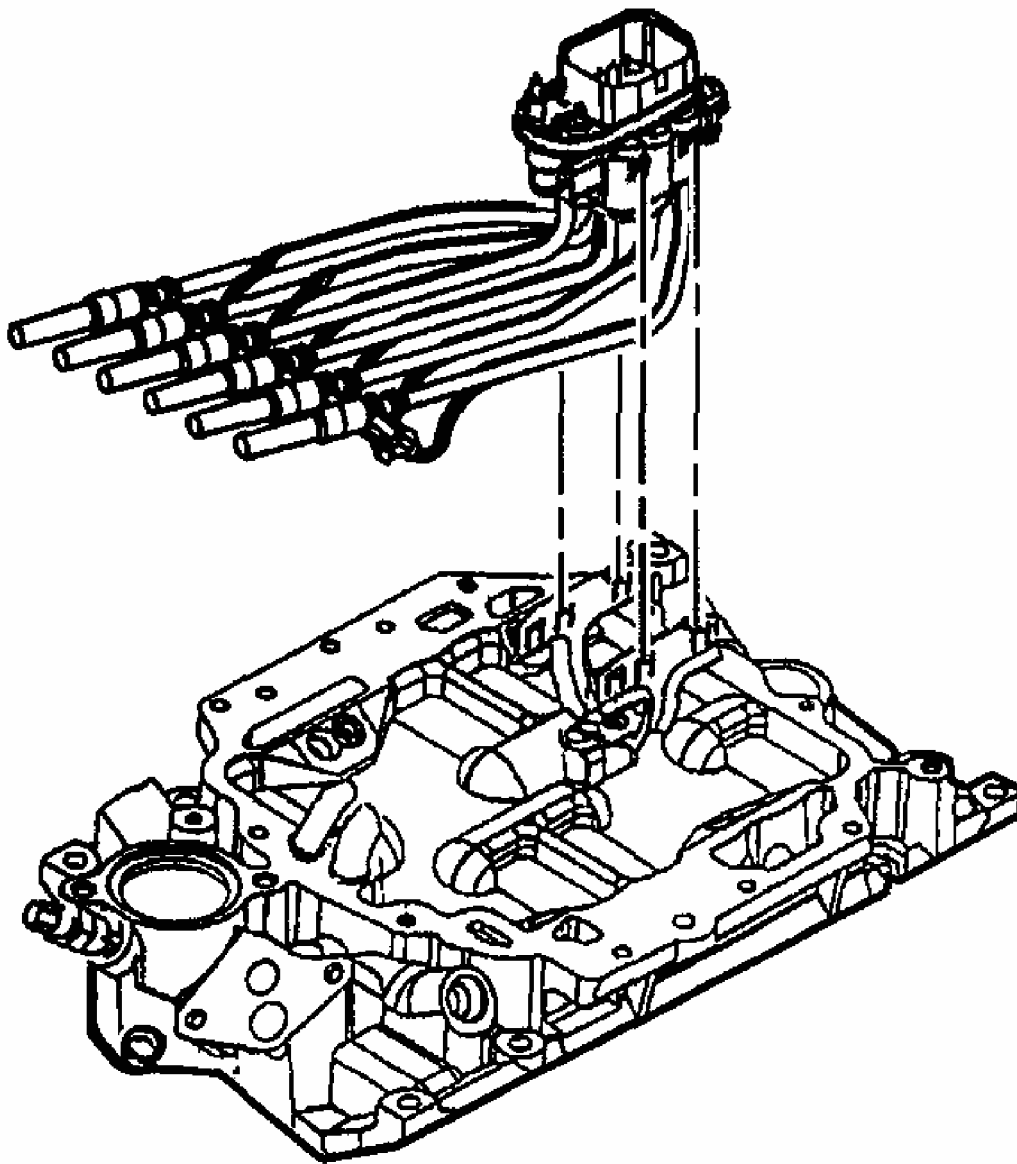
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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

38.3. Tighten the accelerator control cable bracket stud to the throttle body to 12 N.m (106 lb in).

INTAKE MANIFOLD ASSEMBLE (LU3)

1. If reusing the fastener, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the fuel meter body bracket bolt.
2. Install the fuel meter body bracket and bolt. Tighten the fuel meter bracket bolt to 10 N.m (89 lb in).



G02503004

Fig. 256: Fuel Meter Body Bracket & Bolt
Courtesy of GENERAL MOTORS CORP.

Important: All injector lines must face forward as the fuel meter body is snapped into the bracket. Also, the number three fuel tube must be positioned behind the number one fuel tube to eliminate interference with the upper intake manifold when installed.

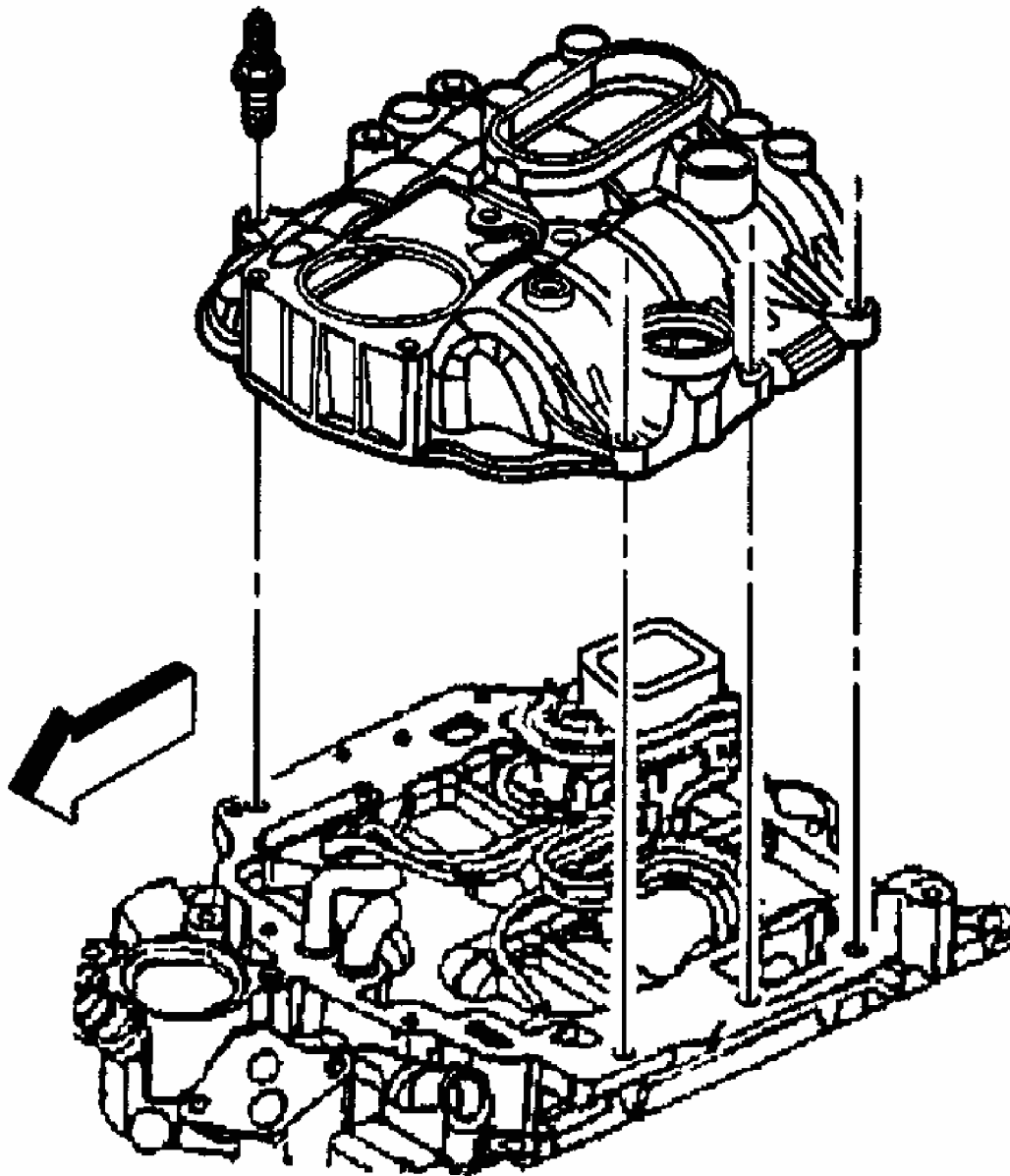
3. Install the fuel meter body into the fuel meter body bracket.
4. Install the 6 injectors into the proper lower intake manifold bores in proper sequence (3,

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5, 1, 2, 4, 6).

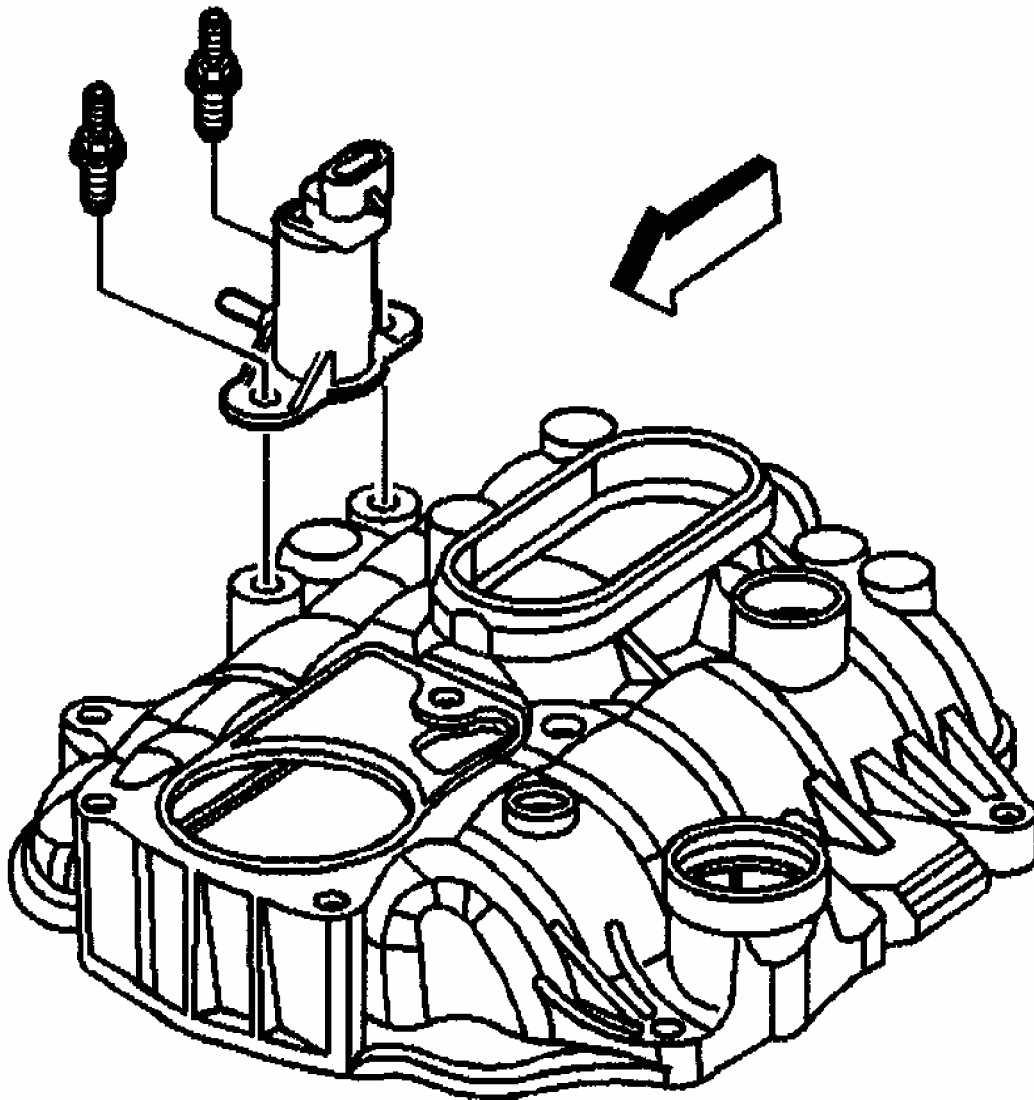
5. Inspect the injectors in order to ensure that they are firmly seated and locked in the lower intake manifold bores.
6. Ensure that the electrical connections of the injectors are positioned so that they do not interfere with each other, and are pointing towards the center of the intake manifold. Rotate the electrical connector inboard if necessary. Also, ensure there is no tension on the injector wires.
7. Install a NEW upper intake manifold to lower intake manifold gasket into the groove of the upper intake manifold.
8. Install the upper intake manifold onto the lower intake manifold.
9. If reusing the fasteners, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the upper intake manifold attaching studs.
10. Install the upper intake manifold attaching studs.
 - 10.1. Tighten the upper intake manifold attaching studs on the first pass to 5 N.m (44 lb in).
 - 10.2. Tighten the upper intake manifold attaching studs on the final pass to 9 N.m (80 lb in).



G02503005

Fig. 257: Upper Intake Manifold Attaching Studs
Courtesy of GENERAL MOTORS CORP.

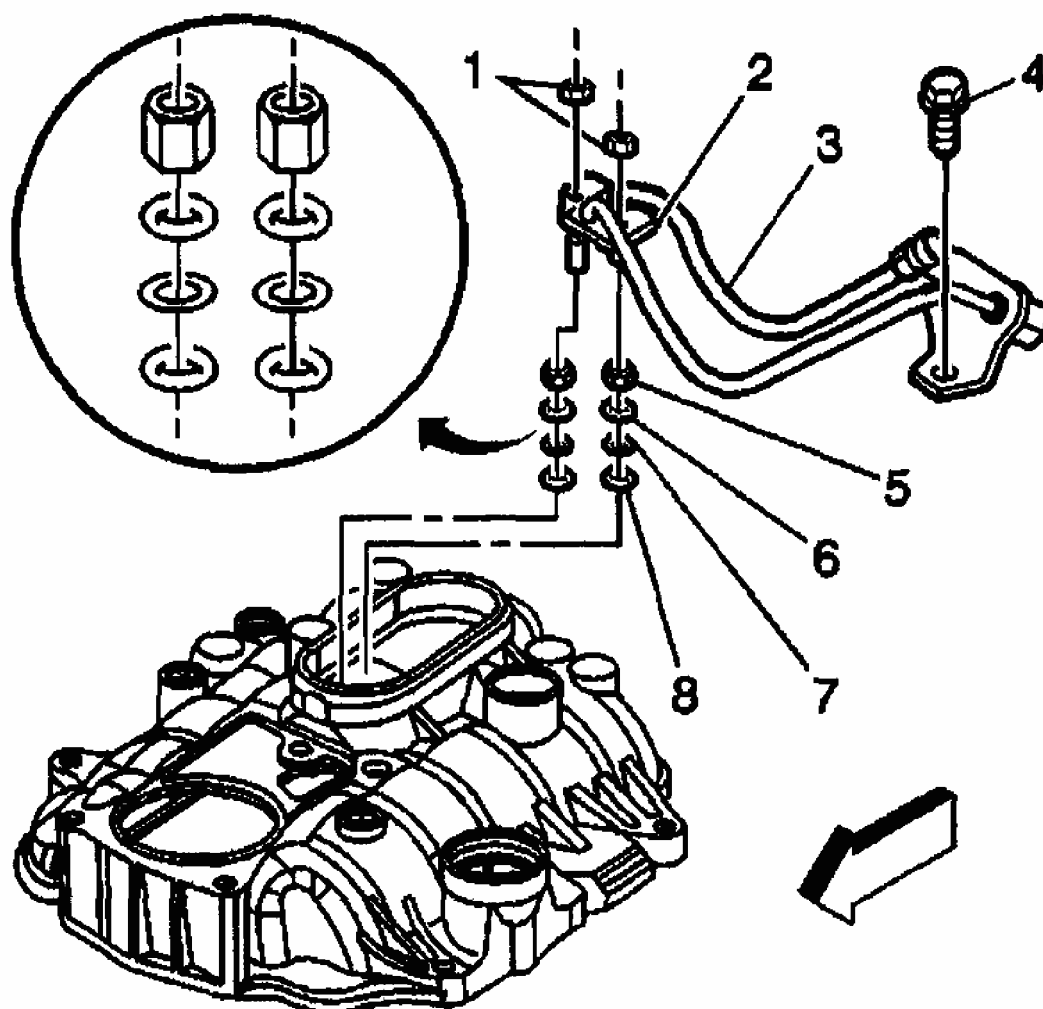
11. If reusing the fasteners, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the evaporative emission (EVAP) canister purge solenoid valve studs.
12. Install the EVAP canister purge solenoid valve and studs. Tighten the EVAP canister purge solenoid valve studs to 10 N.m (89 lb in).



G02503006

Fig. 258: EVAP Canister Purge Solenoid Valve
Courtesy of GENERAL MOTORS CORP.

13. Install the engine wiring harness bracket and nut. Tighten the engine wiring harness bracket nut to 12 N.m (106 lb in).

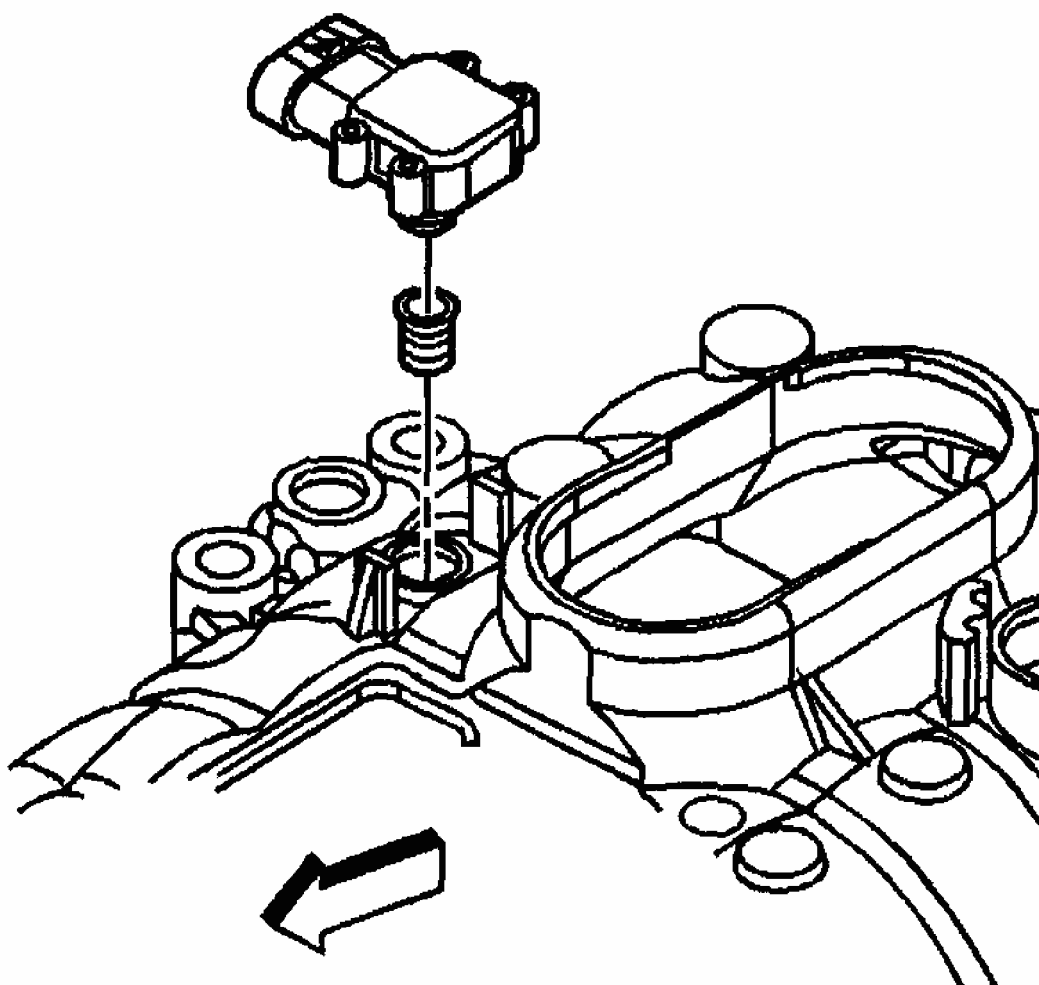


G02503007

Fig. 259: Fuel Meter Body Seals**Courtesy of GENERAL MOTORS CORP.**

14. Install the NEW fuel seals (8), black O-rings, into the fuel meter body.
15. Install the NEW spacer rings (7), flat washers, into the fuel meter body.
16. Install the NEW fuel seals (6), yellow O-rings, into the fuel meter body.
17. Install the NEW fuel seal retainers (5) into the fuel meter body.
18. Install the fuel pipe (3) into the fuel meter body.
19. Install the fuel pipe retainer bracket (2) onto the fuel pipe.
20. Install the fuel pipe retainer bracket nuts (1).
21. If reusing the fastener, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the fuel pipe bolt.

22. Install the fuel pipe bolt (4).
 - 22.1. Tighten the fuel pipe bracket nuts to 3 N.m (27 lb in).
 - 22.2. Tighten the fuel pipe bolt to 6 N.m (53 lb in).
23. Install a NEW manifold absolute pressure (MAP) sensor seal onto the MAP sensor.
24. Apply a small amount, approximately 1 drop, of clean engine oil to the MAP sensor seal.
25. Install the MAP sensor into the upper intake manifold.



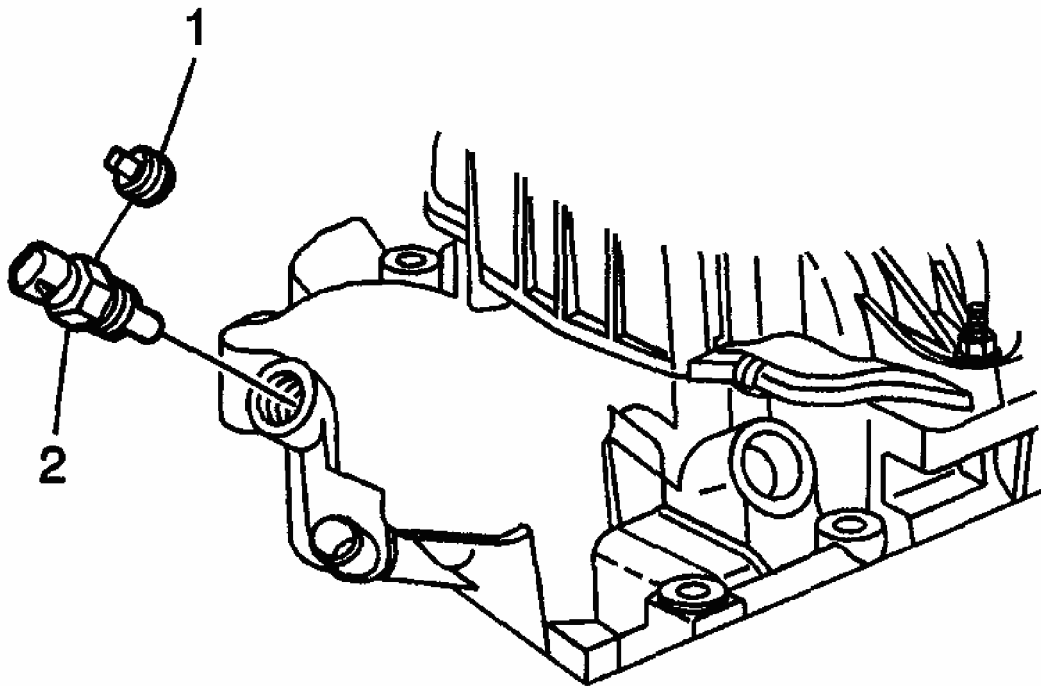
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Fig. 260: MAP Sensor
Courtesy of GENERAL MOTORS CORP.

26. Install the ignition coil and studs. Tighten the ignition coil studs to 12 N.m (106 lb in).
27. If reusing the engine coolant temperature (ECT) sensor plug (1) or the ECT sensor (2),

if equipped, apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the ECT sensor plug (1) or the ECT sensor (2).

28. Install the ECT sensor or plug, if equipped, into the front of the lower intake manifold. Tighten the ECT sensor or plug to 20 N.m (15 lb ft).

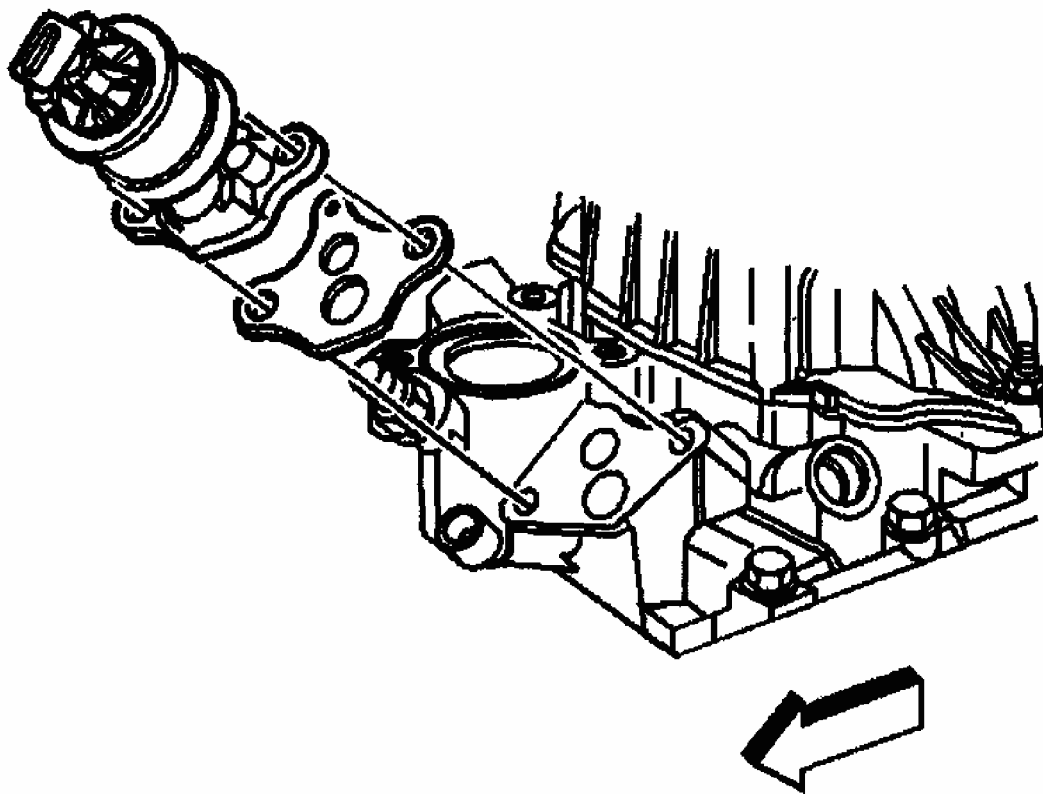


G02503010

Fig. 261: ECT Sensor Or Plug
Courtesy of GENERAL MOTORS CORP.

Important: The exhaust gas recirculation (EGR) valve must be installed in the original orientation. Some applications will not have an EGR valve.

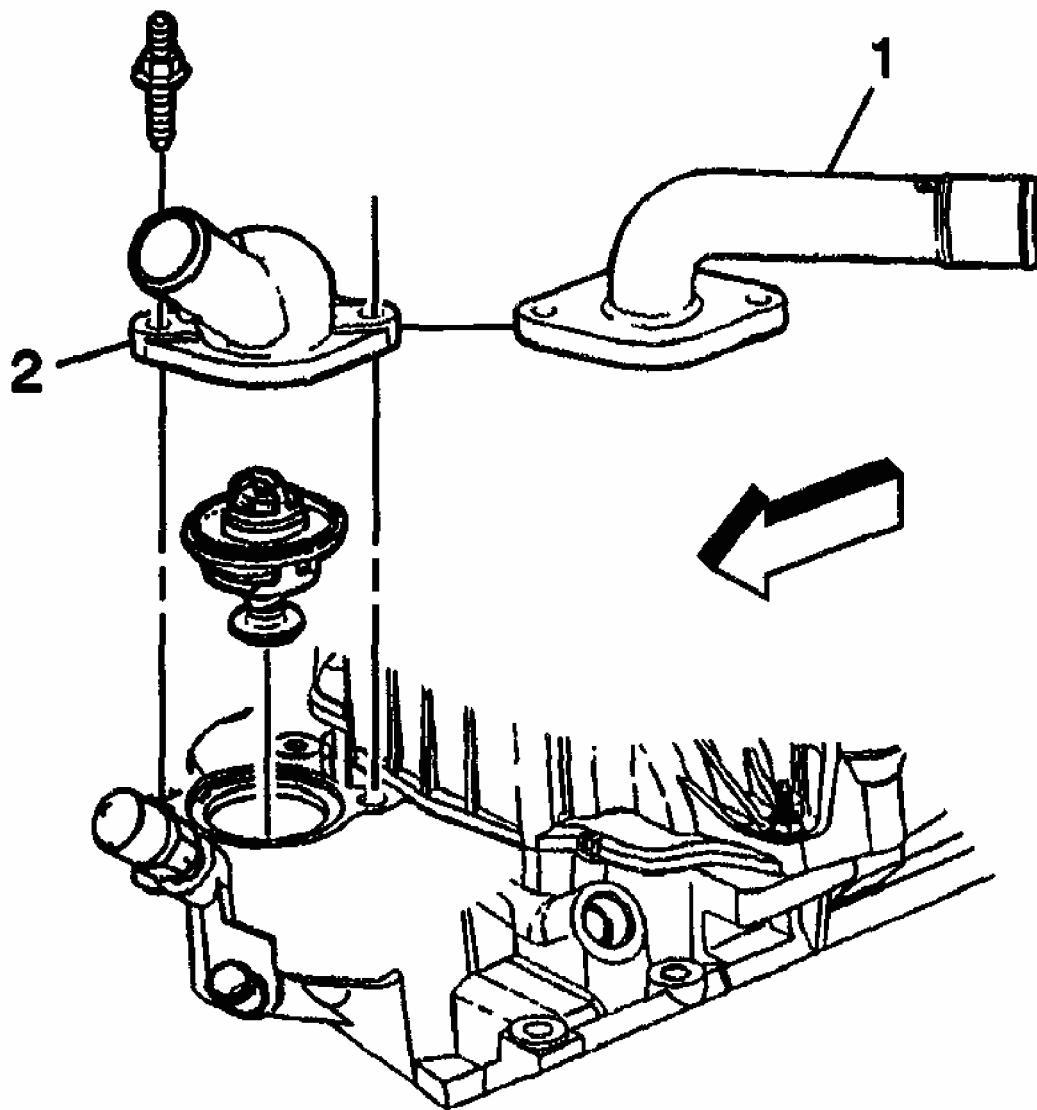
29. Install a NEW EGR valve gasket and the EGR valve.



G02503011

Fig. 262: EGR Valve & Gasket
Courtesy of GENERAL MOTORS CORP.

30. Install the EGR valve bolts.
 - 30.1. Tighten the EGR valve bolts on the first pass to 7 N.m (62 lb in).
 - 30.2. Tighten the EGR valve bolts on the final pass to 30 N.m (22 Lb ft).
31. Install the engine coolant thermostat.
32. Install the water outlet (1 or 2).
33. Install the water outlet studs. Tighten the water outlet studs to 25 N.m (18 Lb ft).

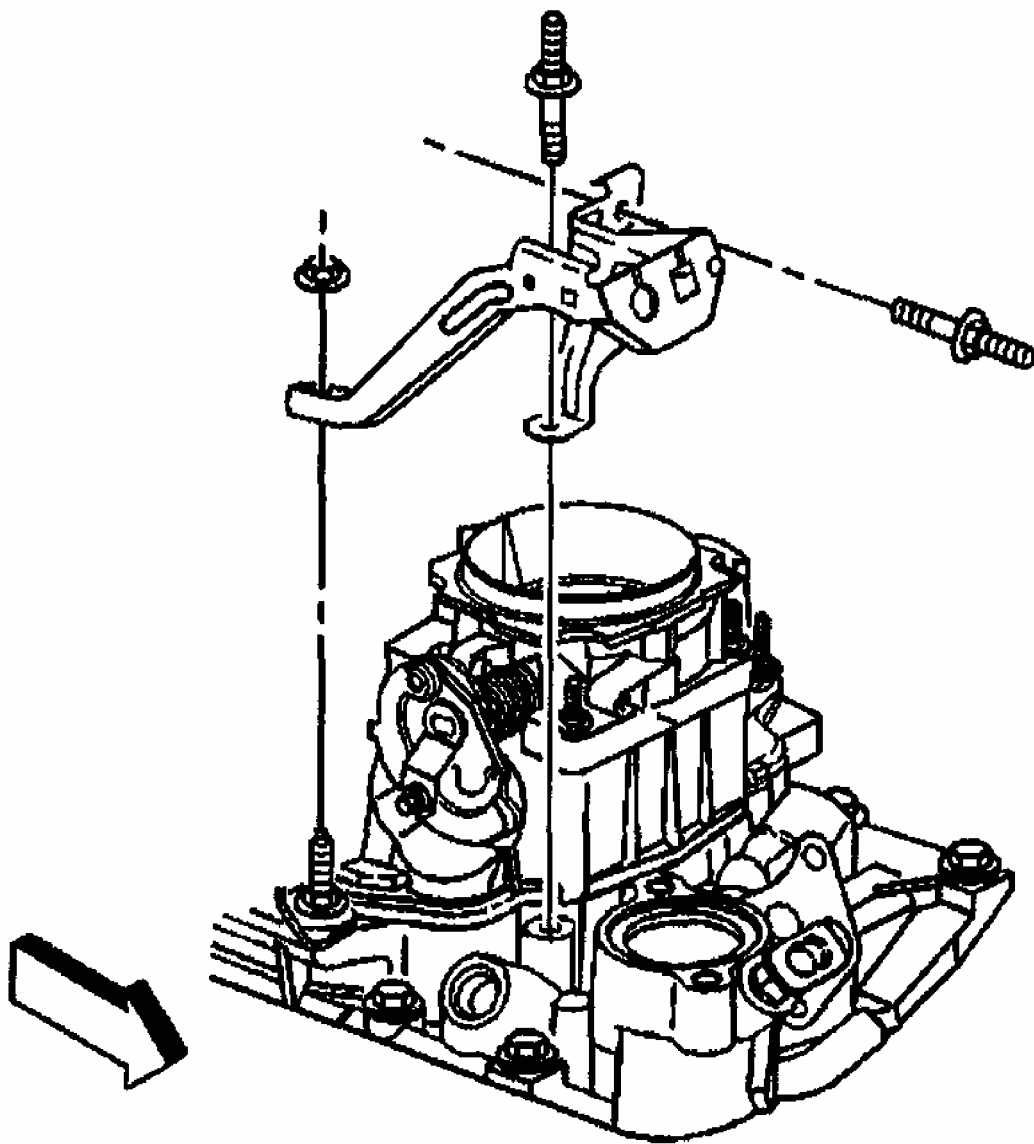


G02503013

Fig. 263: Water Outlet Studs
Courtesy of GENERAL MOTORS CORP.

34. Install a NEW throttle body gasket into the groove in the upper intake manifold.
35. Install the throttle body onto the upper intake manifold.
36. If reusing the fasteners, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the throttle body attaching studs.
37. Install the throttle body attaching studs. Tighten the throttle body attaching studs to 9 N.m (80 lb in).
38. Install the accelerator control cable bracket, the studs, and the nuts.

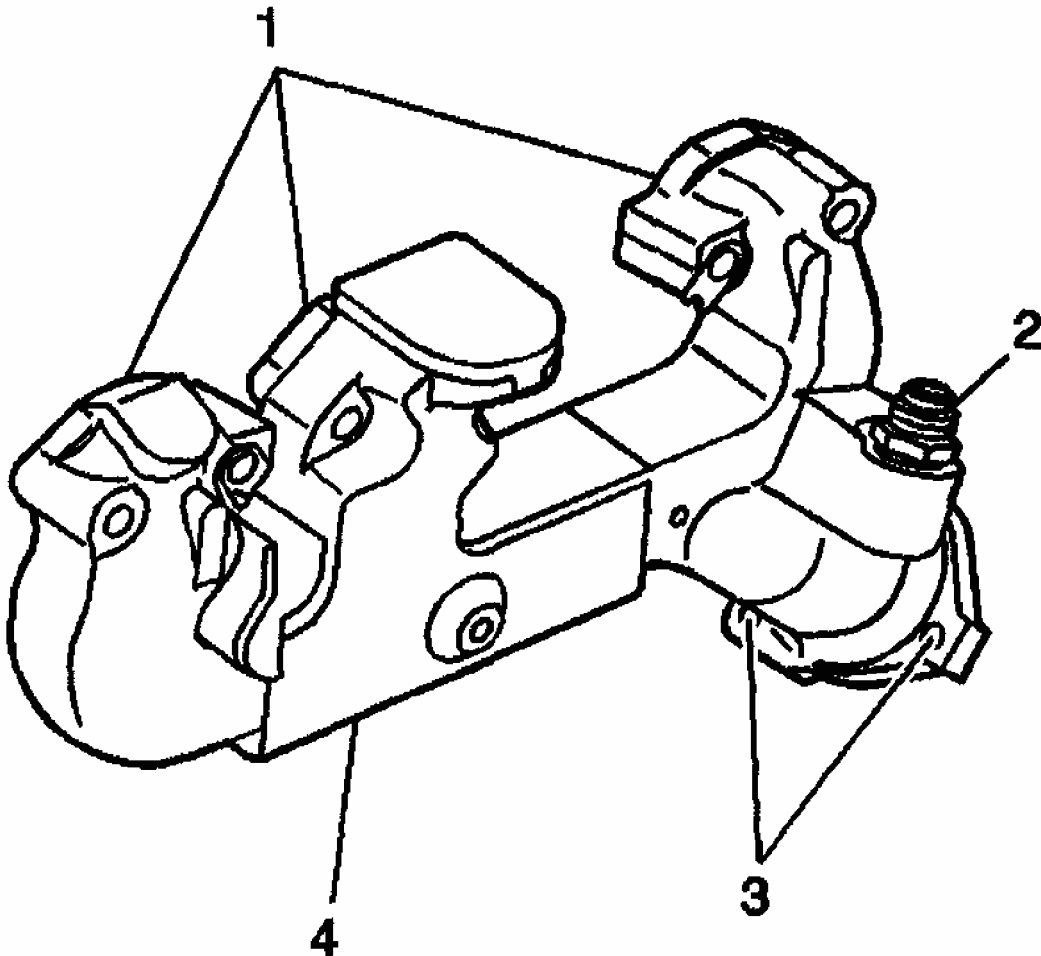
- 38.1. Tighten the accelerator control cable bracket stud to the intake manifold to 6 N.m (53 lb in).
- 38.2. Tighten the accelerator control cable bracket nuts to 12 N.m (106 lb in).
- 38.3. Tighten the accelerator control cable bracket stud to the throttle body to 12 N.m (106 lb in).



G02503016

Fig. 264: Accelerator Control Cable Bracket
Courtesy of GENERAL MOTORS CORP.

1. Clean the exhaust manifolds in cleaning solvent.
2. Dry the components with compressed air.
3. Inspect the exhaust manifolds for the following:
 - Damage to the gasket sealing surfaces (1)
 - Damage to the exhaust gas recirculation (EGR) pipe fitting (2), left manifold
 - Damage to the threaded holes (3)
 - Restrictions within exhaust passages
 - Broken or damaged exhaust manifold heat shields (4), if applicable
 - Broken or damaged exhaust manifold

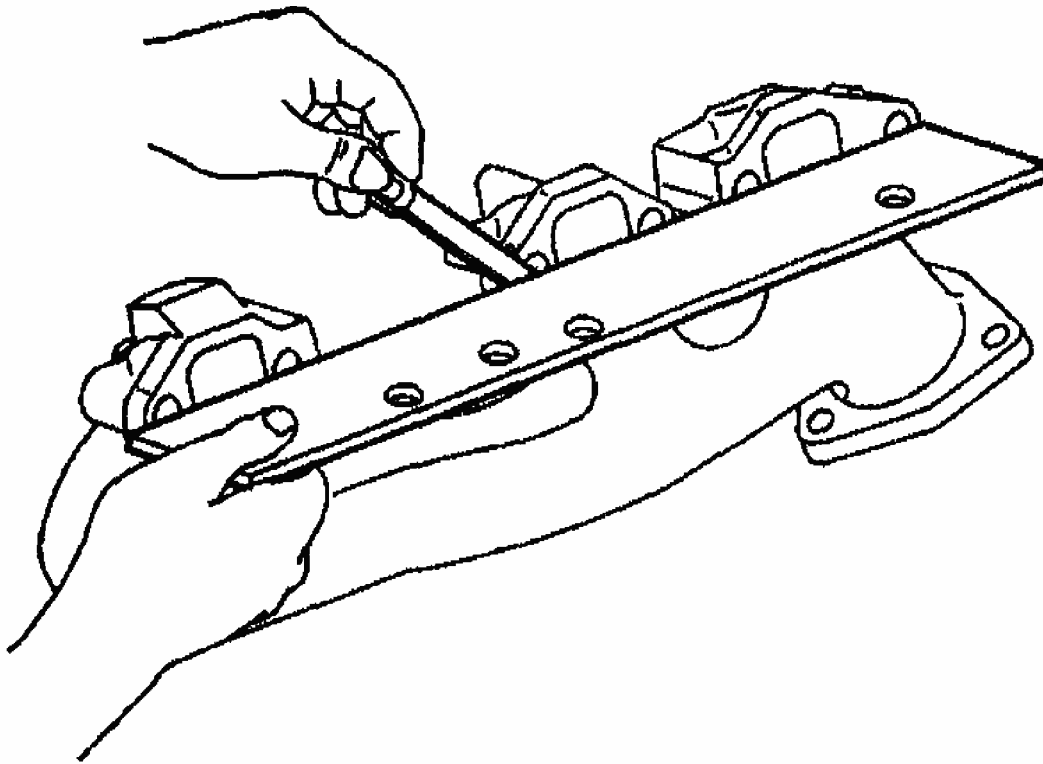


G02503017

Fig. 265: Exhaust Manifold Assembly
Courtesy of GENERAL MOTORS CORP.

4. Measure the alignment or surface flatness of the exhaust manifold flanges using a straight edge and a feeler gage. Refer to **Engine Mechanical Specifications** .

If the surface flatness is not within the specifications, the exhaust manifold is warped and must be replaced.



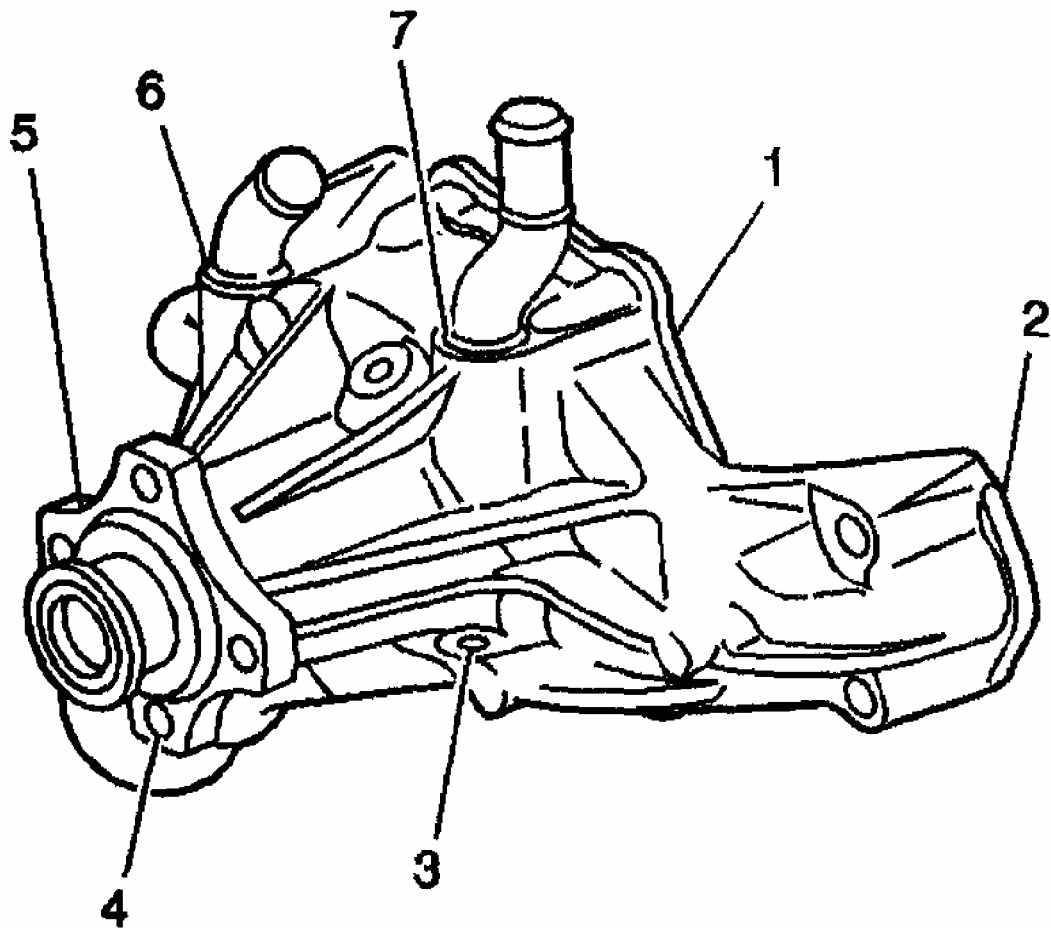
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Fig. 266: Checking Surface Flatness Of The Exhaust Manifold Flanges
Courtesy of GENERAL MOTORS CORP.

WATER PUMP CLEANING AND INSPECTION

1. Remove the old gasket material from the water pump sealing surfaces.
2. Clean all the dirt and any debris from the water pump.
3. Inspect the water pump for the following:
 - Leakage or damage to the housing cover or gasket (1)
 - Excessive scratches or gouging to the gasket sealing surfaces (2)
 - Leakage from the water pump vent hole (3). A stain around the vent hole is acceptable. If leakage occurred (dripping) with the engine operating and the cooling system pressurized, then replace the water pump.

- Damaged bolt hole threads (4)
- Excessive side-to-side movement of the water pump shaft (5)
- Leakage around the water inlet pipe (6)
- Leakage around the heater hose pipe (7)
- Restrictions within the internal coolant passages



G02503019

Fig. 267: Water Pump Assembly
Courtesy of GENERAL MOTORS CORP.

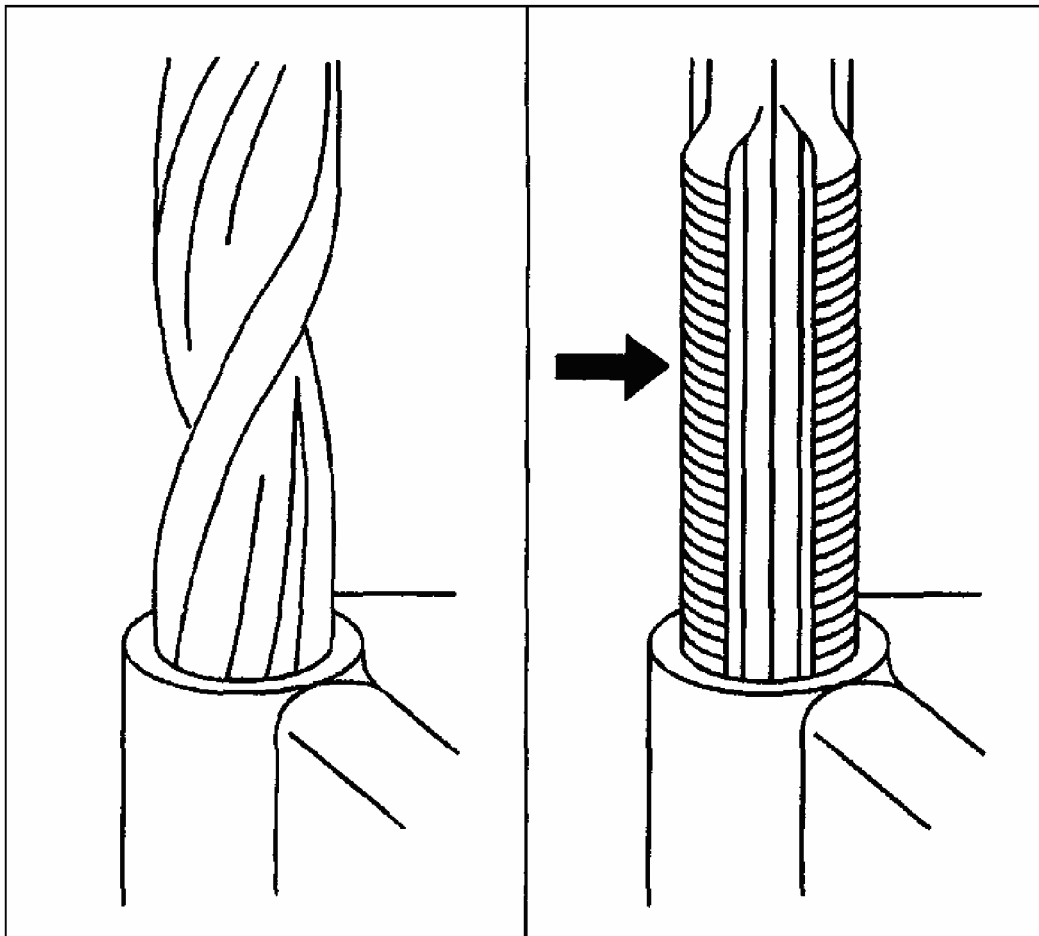
THREAD REPAIR

General purpose thread repair kits are available commercially.

Important: Refer to the thread repair kit manufacturer's instructions regarding the size of the drill and which tap to use.

Always avoid any buildup of chips. Back out the tap every few turns and remove the chips.

1. Determine the size, the pitch, and the depth of the damaged thread.
2. Adjust the stop collars on the cutting tool as needed. Tap the stop collars to the required depth.



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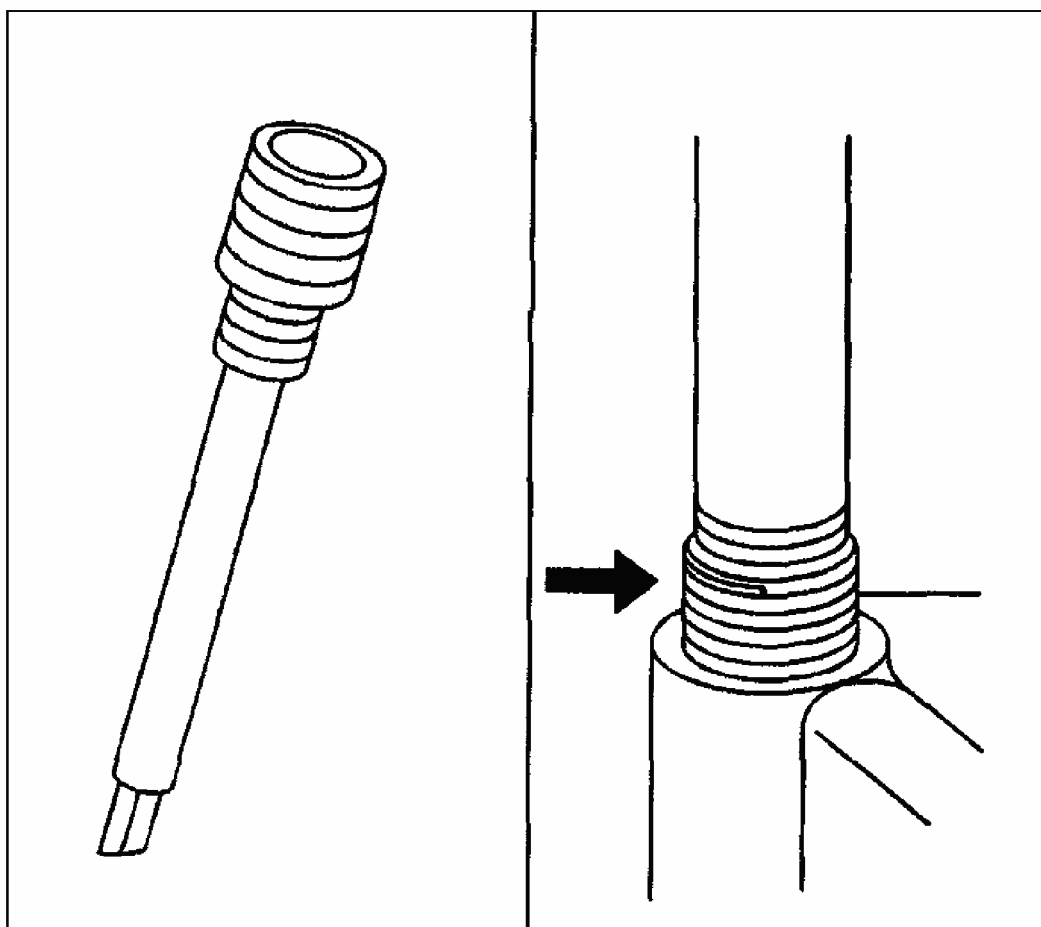
Fig. 268: Repairing Threads Using Tap
Courtesy of GENERAL MOTORS CORP.

3. Drill out the damaged thread.
4. Remove the chips.
5. Apply clean engine oil to the top thread.
6. Use the tap in order to cut new thread.
7. Clean the thread.
8. Screw the thread insert onto the mandrel of the thread insert installer. Engage the tang

of the thread insert onto the end of the mandrel.

Important: The thread insert should be flush to 1 turn below the surface.

9. Lubricate the thread insert with clean engine oil - except when installing in aluminum - and install the thread insert.
10. If the tang of the thread insert does not break off when backing out the thread insert installer, break off the tang using a drift punch.



G02503021

Fig. 269: Repairing Threads Using Insert
Courtesy of GENERAL MOTORS CORP.

SERVICE PRIOR TO ASSEMBLY

- Dirt will cause premature wear of the rebuilt engine. Clean all the components.
- Use the proper tools to measure the components when checking for excessive wear.

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Components not within the manufacturer's specification must be repaired or replaced.

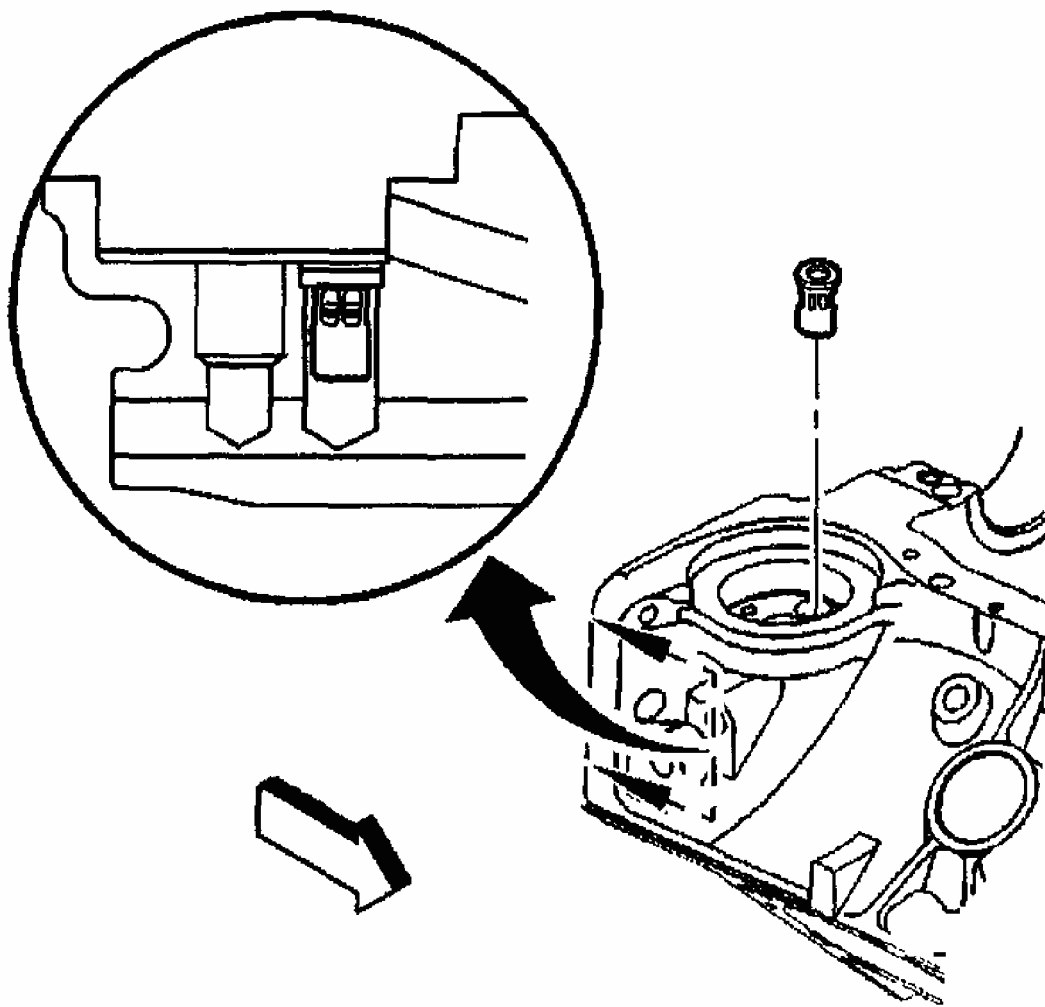
- When the components are re-installed into an engine, return the components to the original location, position, and direction.

ENGINE BLOCK PLUG INSTALLATION

Tools Required

J 41712 Oil Pressure Switch Socket

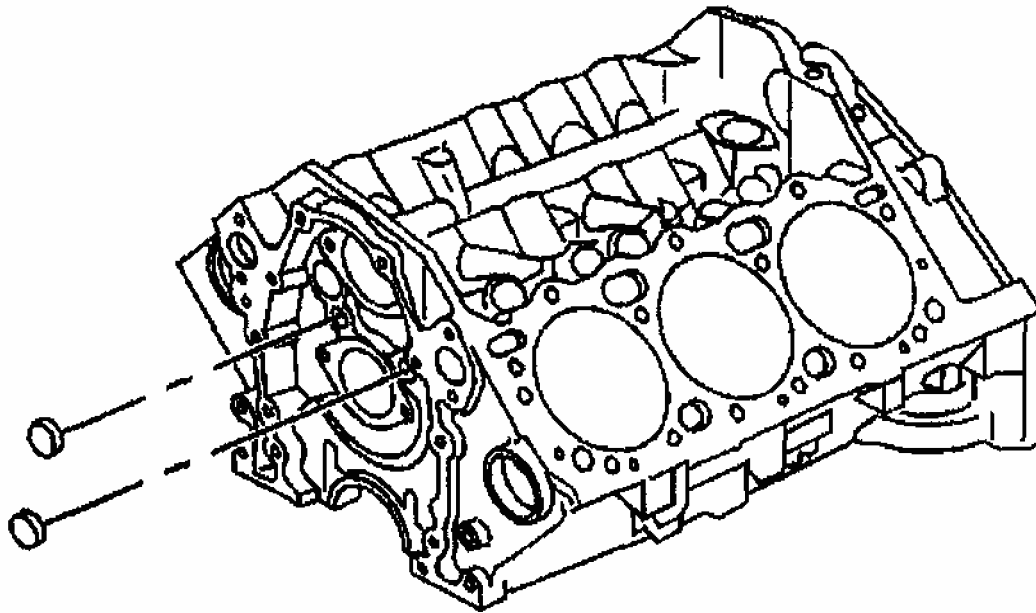
1. Install a NEW oil filter bypass valve.
 - 1.1. Install the oil filter bypass valve into the oil gallery bore until slightly below flush with the surface of the engine block.
 - 1.2. Using a pointed punch, stake the engine block area around the oil filter bypass valve. Stake in 3 locations 120 degrees apart.



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Fig. 270: Oil Filter Bypass Valve
Courtesy of GENERAL MOTORS CORP.

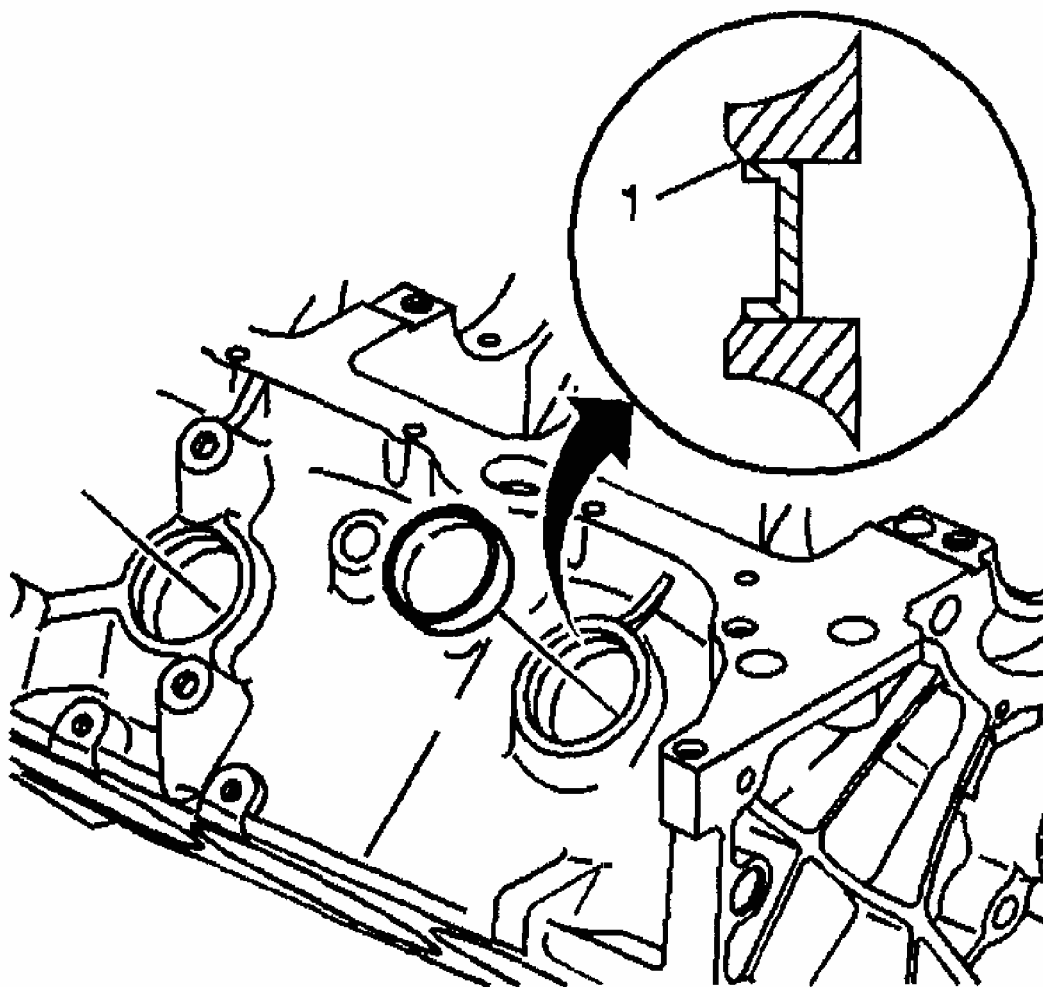
2. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the outside diameter of the NEW front engine oil gallery plugs.
3. Install the NEW front engine block oil gallery plugs. A properly installed front engine oil gallery plug must be installed slightly below flush with the front face of the engine block.



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Fig. 271: Front Engine Block Oil Gallery Plugs
Courtesy of GENERAL MOTORS CORP.

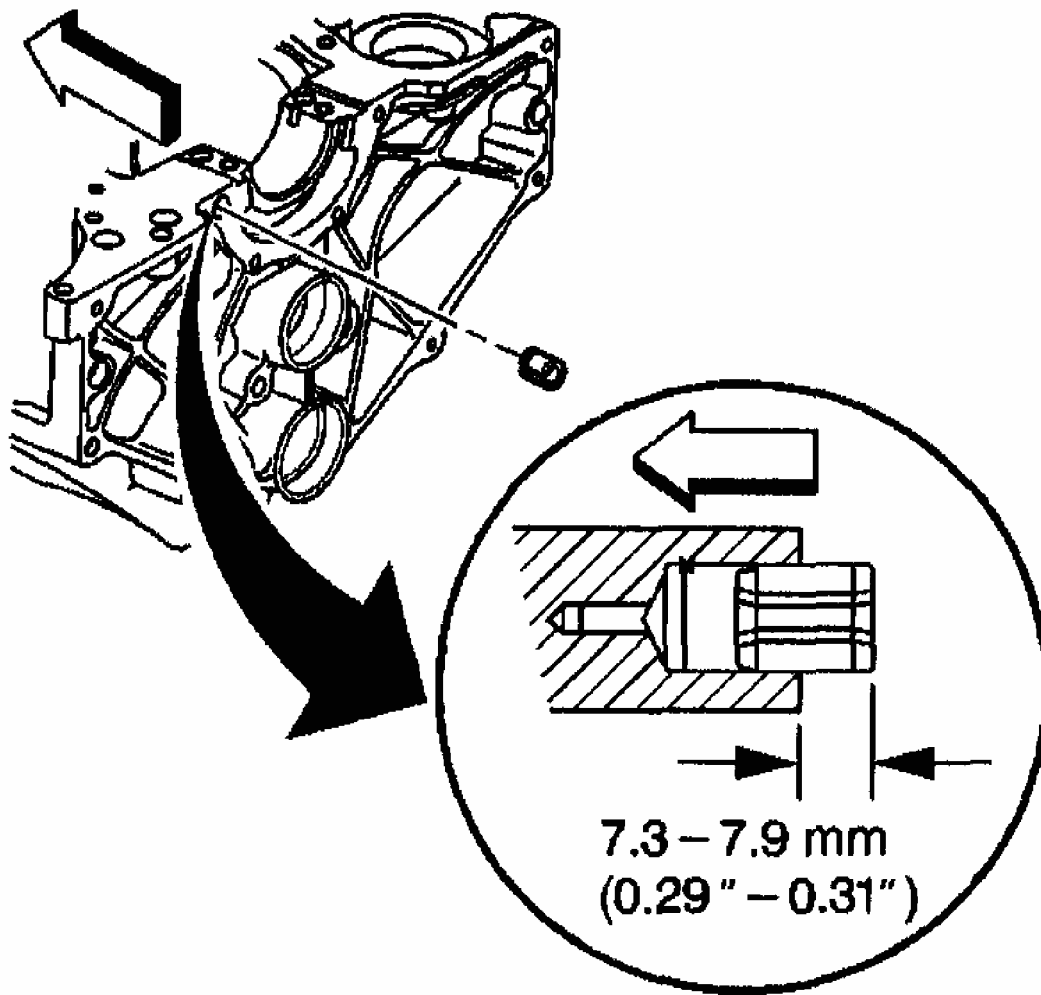
4. Apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the outside diameter of the NEW engine block core hole plugs.
5. Install the NEW engine block core hole plugs. A properly installed engine block core hole plug must be installed flush or below the bottom of the chamfer (1) of the engine block core hole.



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Fig. 272: Engine Block Core Hole Plugs
Courtesy of GENERAL MOTORS CORP.

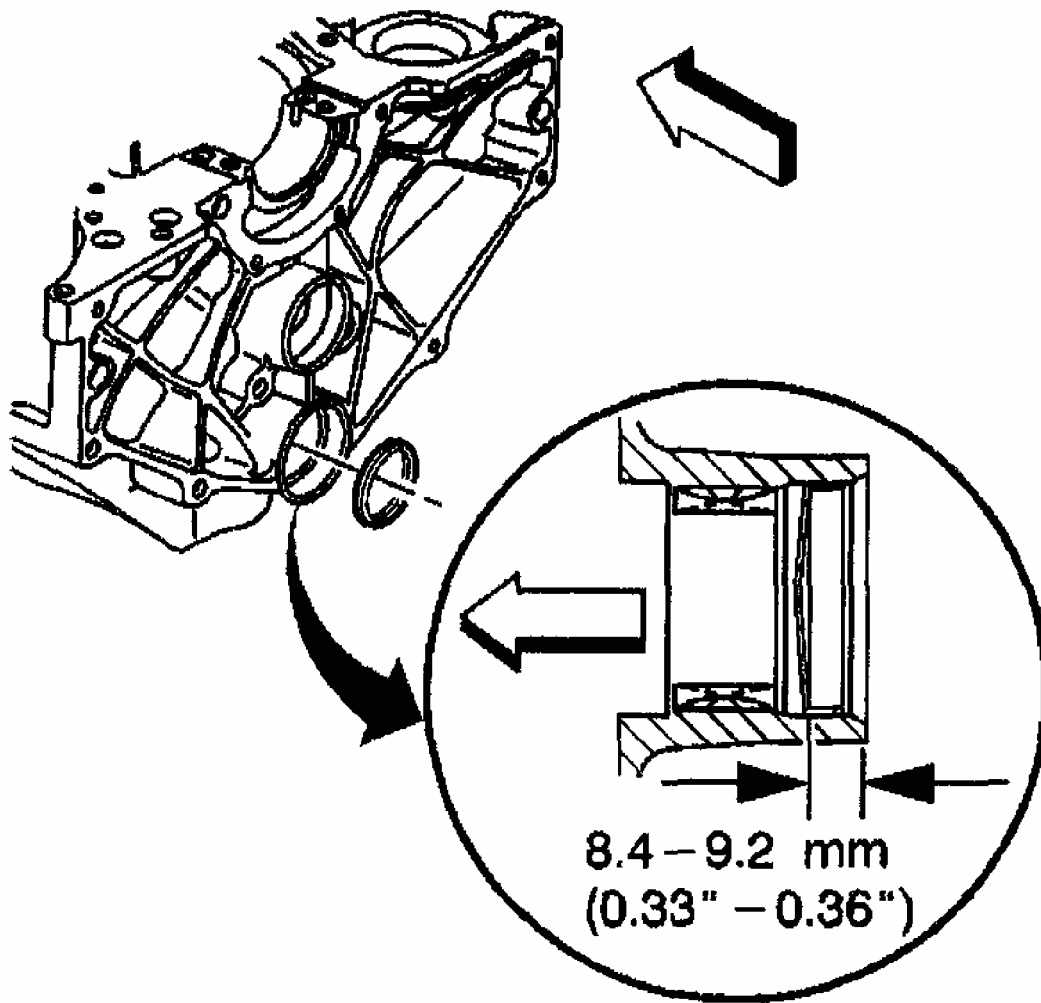
6. Install the crankshaft rear oil seal housing locator spring type S pin, if required.



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Fig. 273: Crankshaft Rear Oil Seal Housing Locator Spring Type S Pin
Courtesy of GENERAL MOTORS CORP.

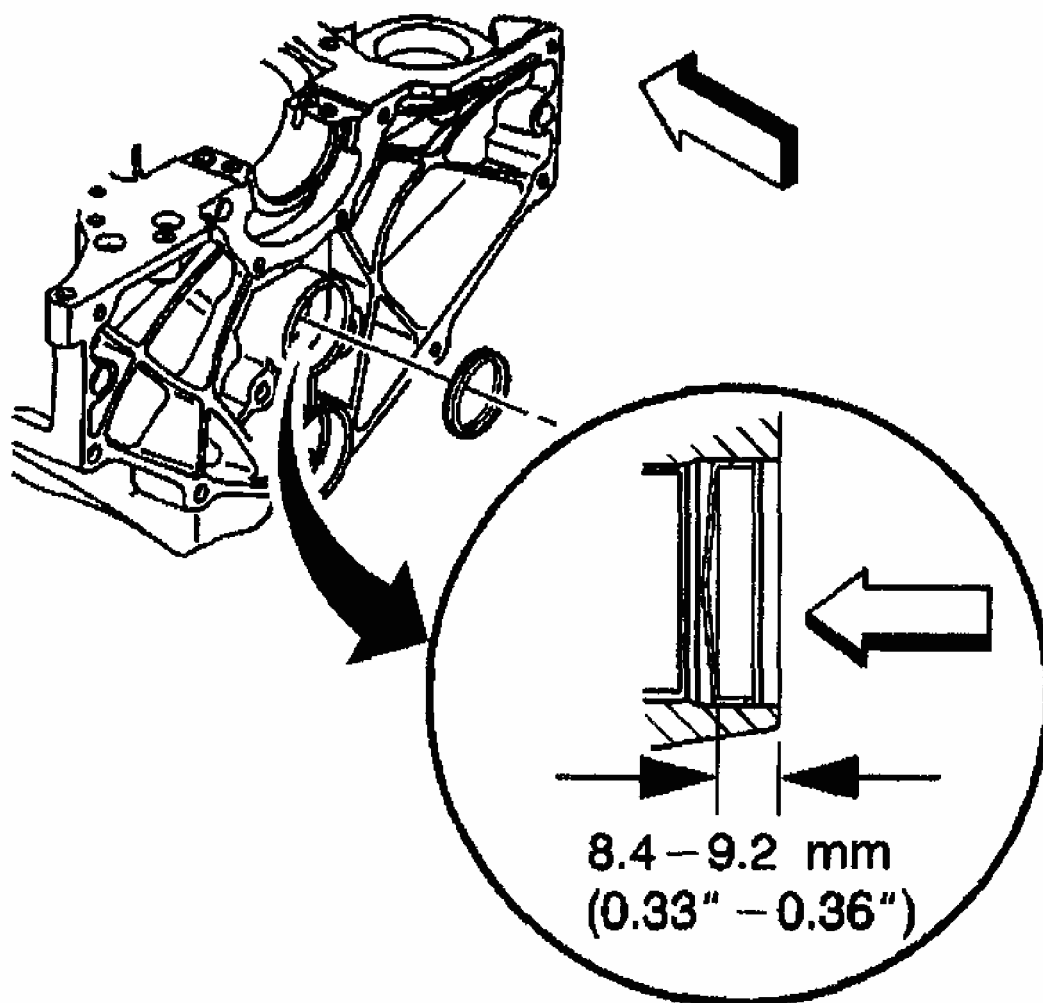
7. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the outside diameter of the NEW expansion cup plug.
8. Install the NEW expansion cup plug into the balance shaft rear bearing hole.



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Fig. 274: Balance Shaft Rear Bearing Hole Expansion Cup Plug
Courtesy of GENERAL MOTORS CORP.

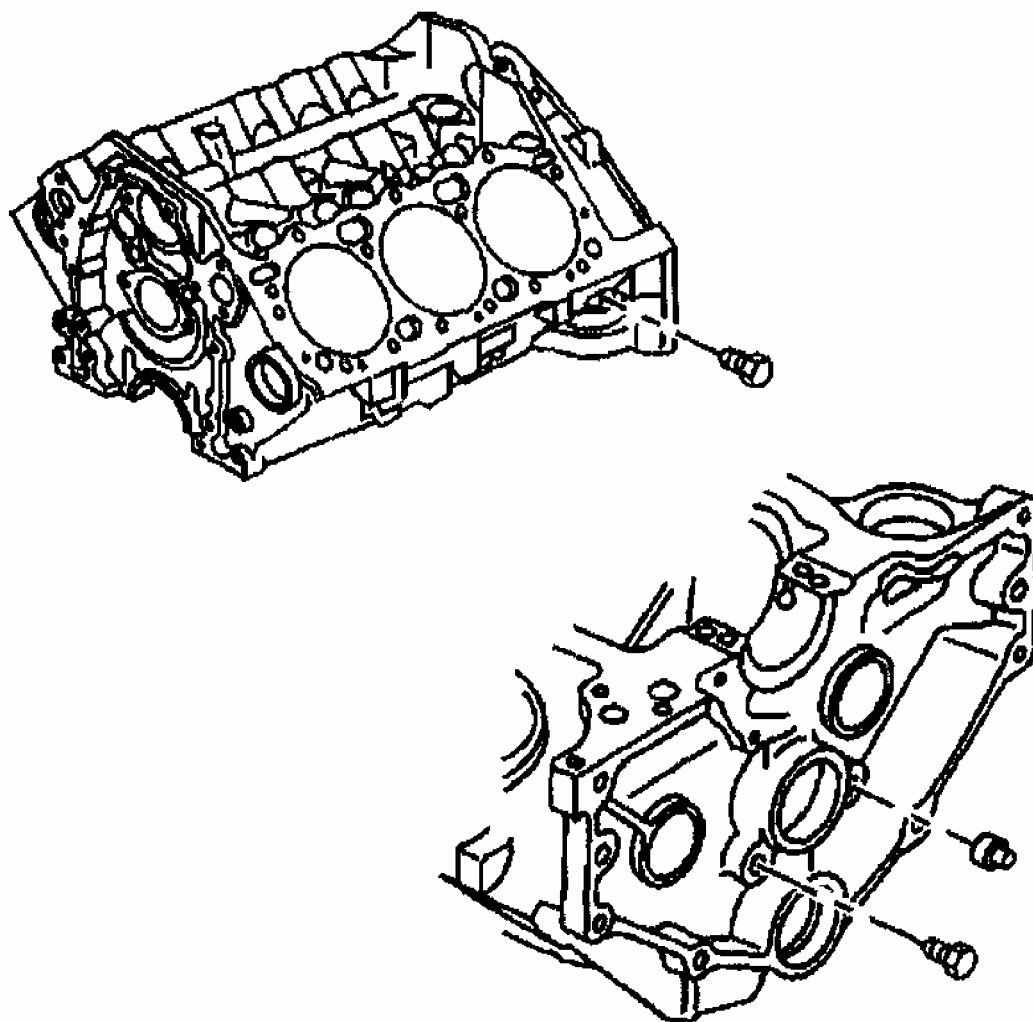
9. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the outside diameter of the NEW expansion cup plug.
10. Install the NEW expansion cup plug into the camshaft rear bearing hole.



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Fig. 275: Camshaft Rear Bearing Hole Expansion Cup Plug
Courtesy of GENERAL MOTORS CORP.

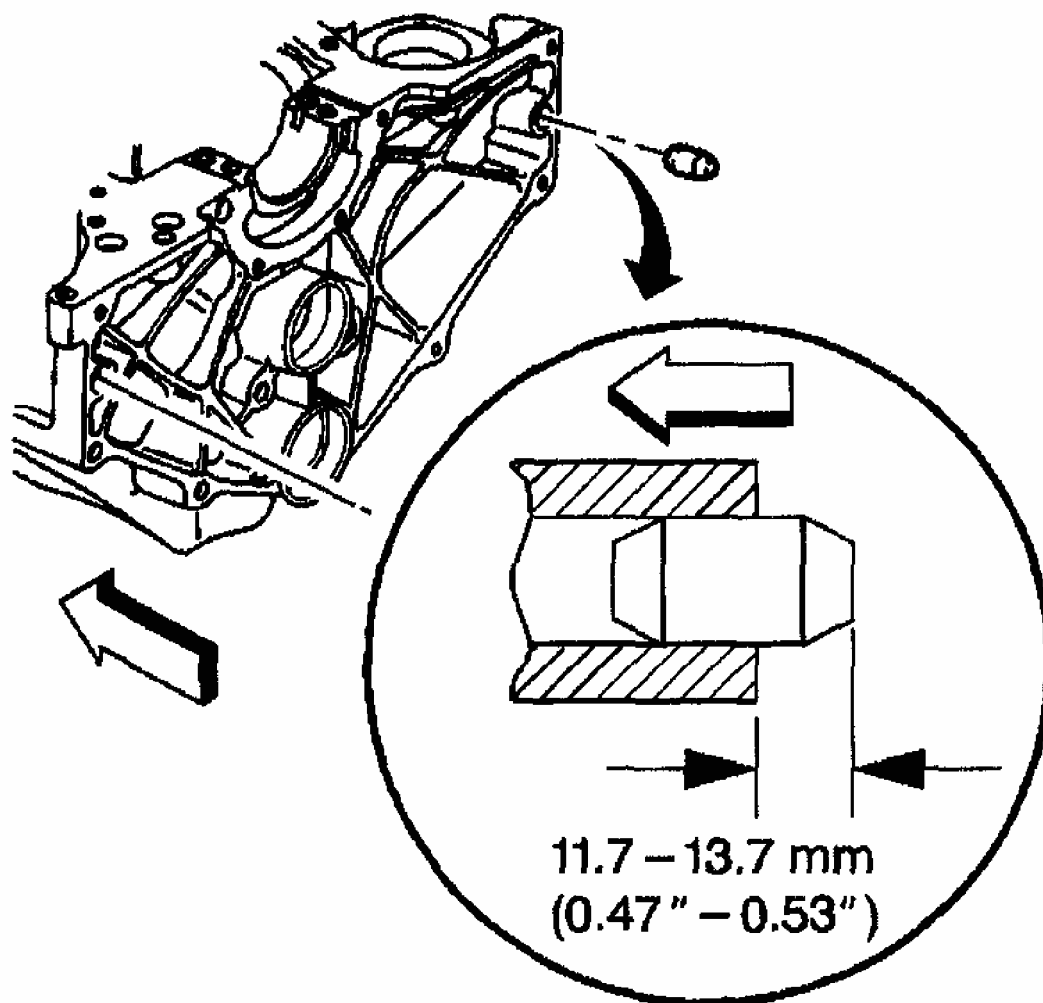
11. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the engine block right rear oil gallery plug, the engine block left rear oil gallery plug, and the engine block left side oil gallery plug.
12. Install the engine block right rear oil gallery plug, the engine block left rear oil gallery plug, and the engine block left side oil gallery plug.
 - Tighten the engine block left side oil gallery plug and the engine block right rear oil gallery plug to 20 N.m (15 Lb ft).
 - Tighten the engine block left rear oil gallery plug to 30 N.m (22 Lb ft).



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Fig. 276: Engine Block Right & Left Rear Oil Gallery Plugs
Courtesy of GENERAL MOTORS CORP.

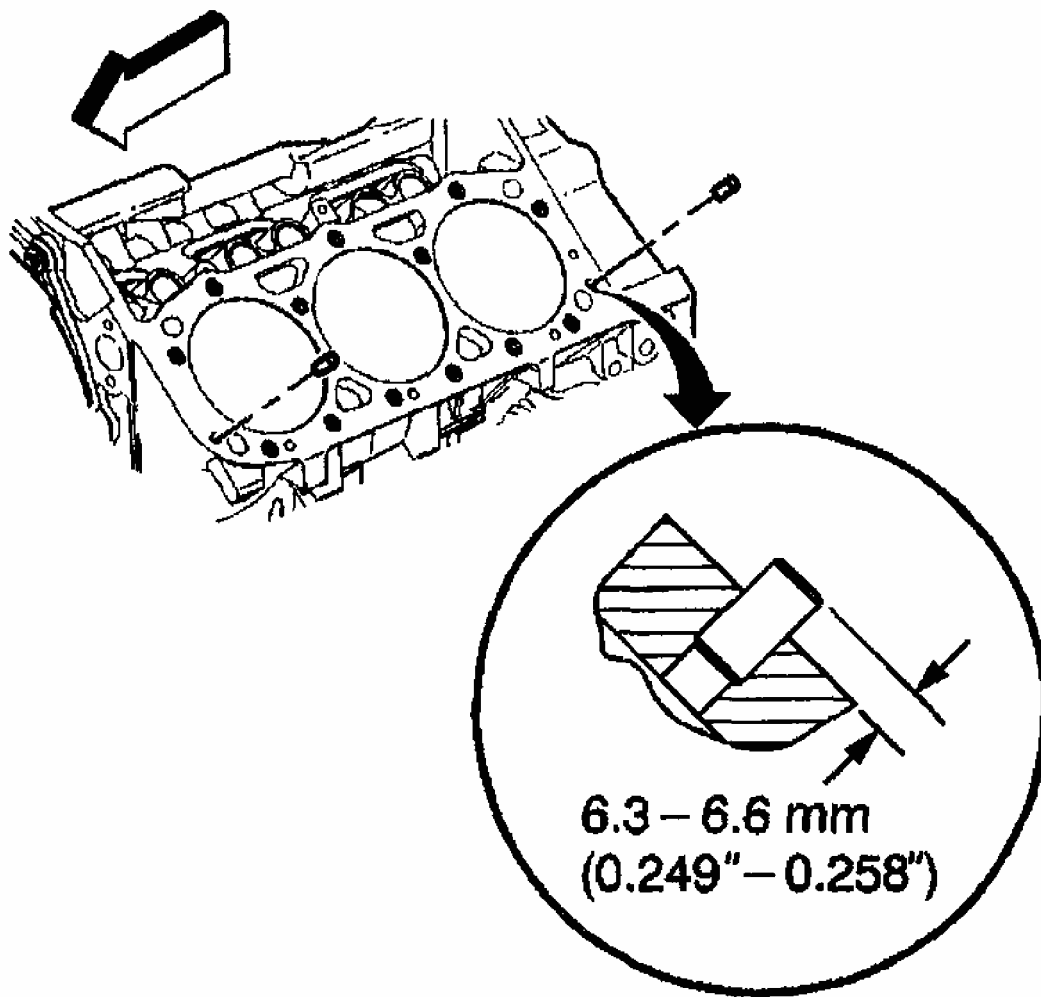
13. Install the transmission locator dowel straight pins, if required.



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Fig. 277: Transmission Locator Dowel Straight Pins
Courtesy of GENERAL MOTORS CORP.

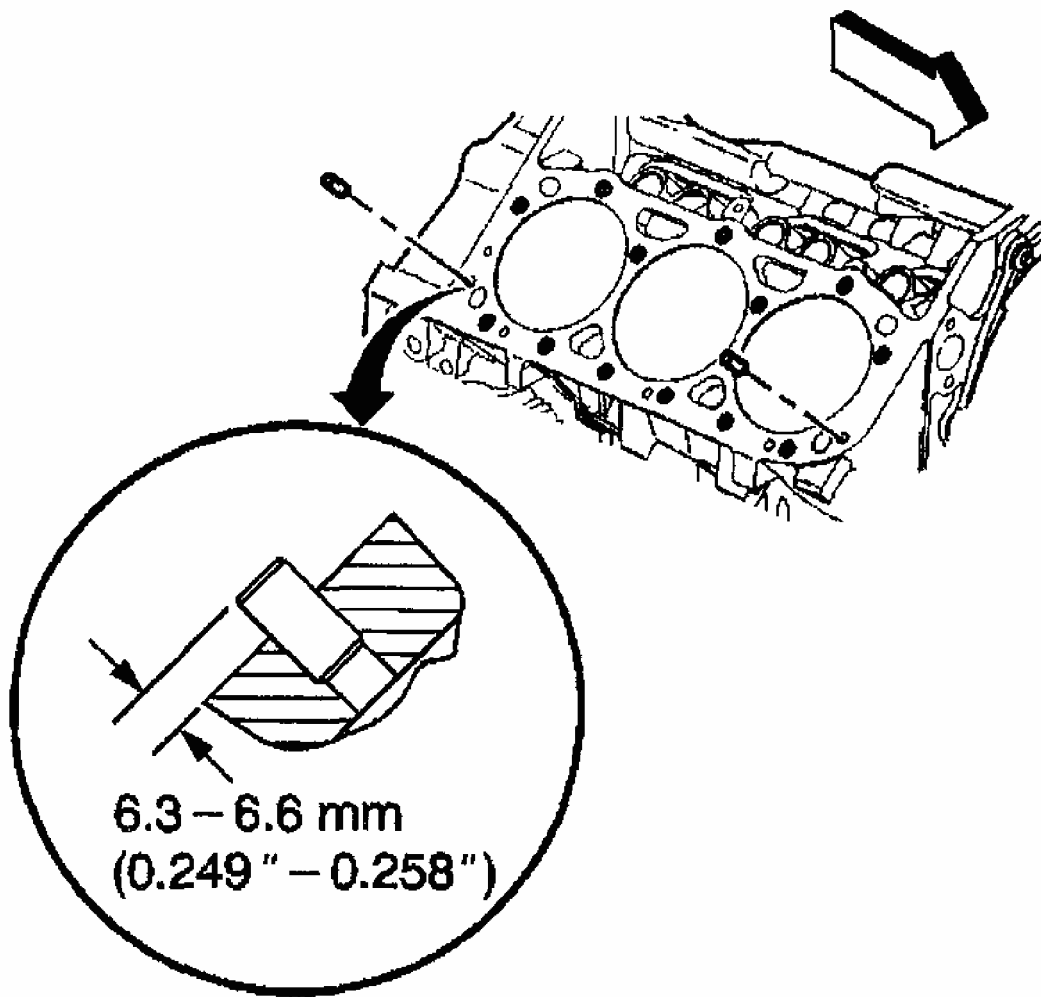
14. Install the left side cylinder head locator dowel pins, if required.



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Fig. 278: Left Side Cylinder Head Locator Dowel Pins
Courtesy of GENERAL MOTORS CORP.

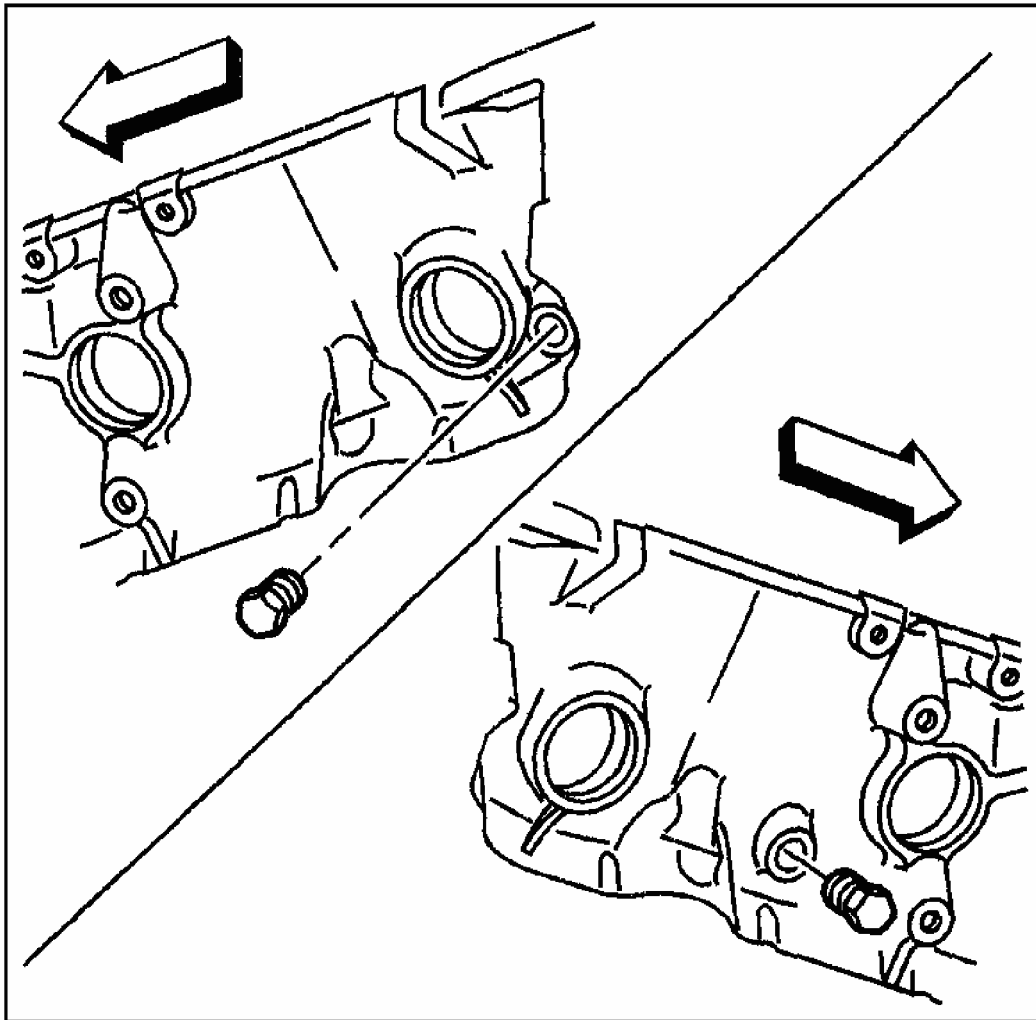
15. Install the right side cylinder head locator dowel pins, if required.



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Fig. 279: Right Side Cylinder Head Locator Dowel Pins
Courtesy of GENERAL MOTORS CORP.

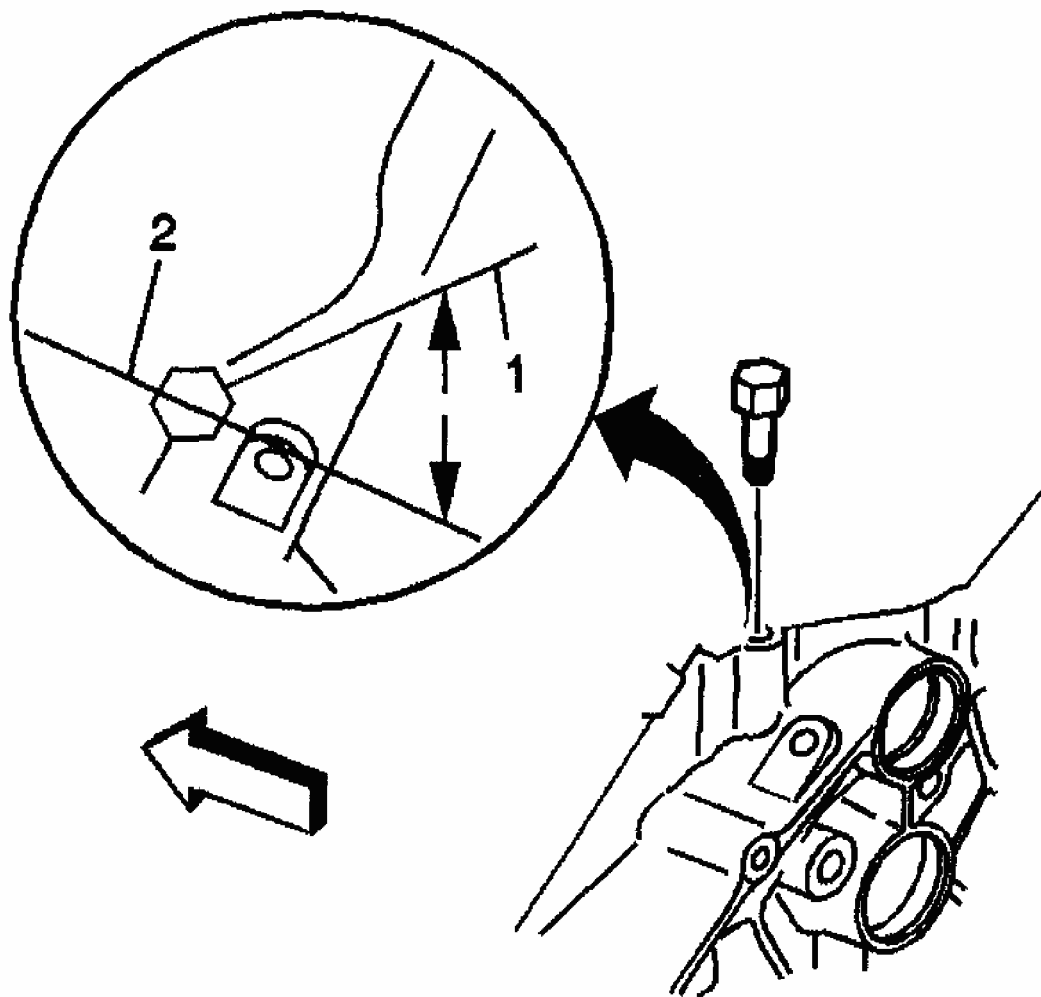
16. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the engine block coolant drain hole plugs.
17. Install the engine block coolant drain hole plugs. Tighten the engine block coolant hole plugs to 20 N.m (15 lb ft).



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Fig. 280: Engine Block Coolant Drain Hole Plugs
Courtesy of GENERAL MOTORS CORP.

18. If reusing the engine oil pressure sensor fitting, apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the engine oil pressure sensor fitting.



G02503033

Fig. 281: Engine Oil Pressure Sensor Fitting
 Courtesy of GENERAL MOTORS CORP.

Important: Do not loosen the engine oil pressure fitting after the initial torque has been obtained.

19. Install the engine oil pressure sensor fitting. Tighten the engine oil pressure sensor fitting to 15 N.m (11 Lb ft).

Important: Do not rotate the engine oil pressure fitting clockwise more than 359 degrees after the initial torque has been obtained.

20. Rotate the engine oil pressure sensor fitting clockwise to the proper position (1), 50 degrees from the centerline (2).
21. If reusing the engine oil pressure gage sensor, apply sealant GM P/N United States

12346004, GM P/N Canada 10953480, or equivalent, to the threads of the engine oil pressure gage sensor.

22. Install the engine oil pressure gage sensor using the J 41712. Tighten the engine oil pressure gage sensor to 30 N.m (22 Lb ft).

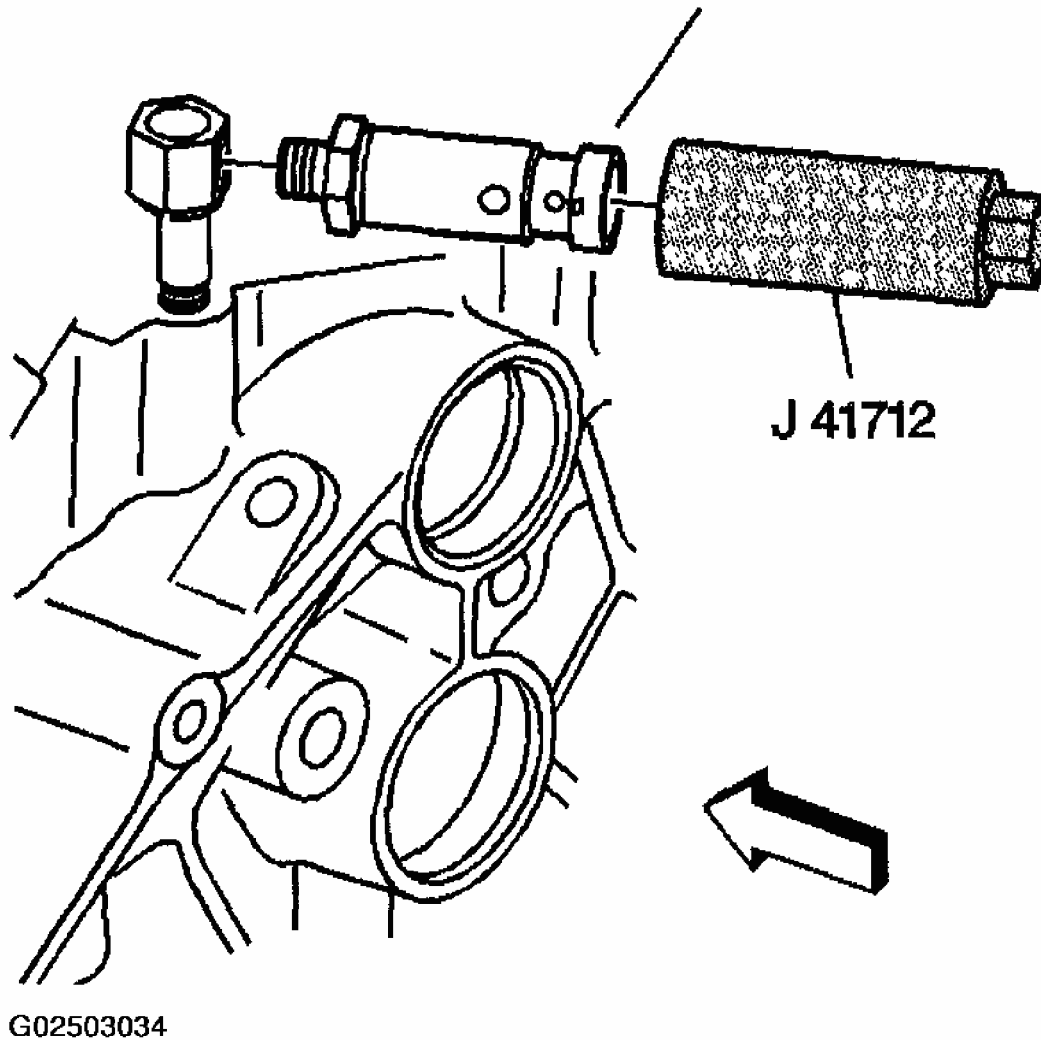
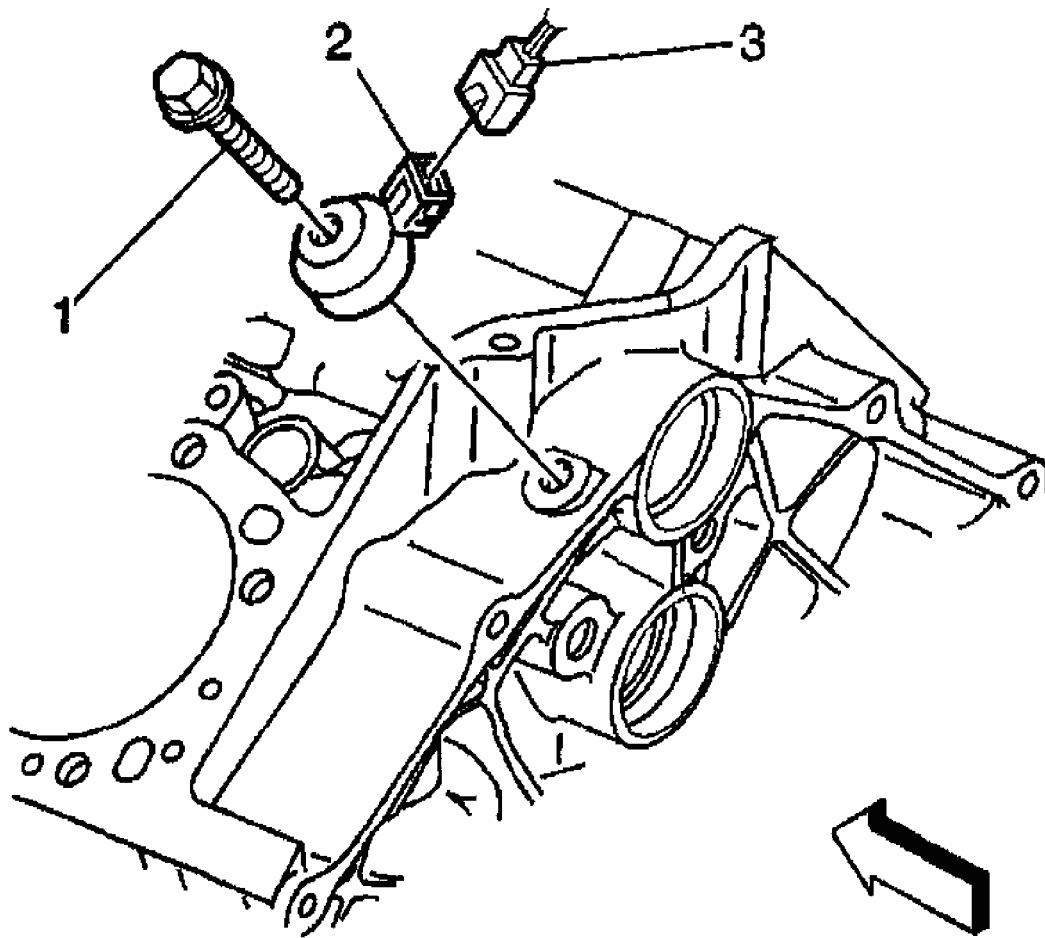


Fig. 282: Engine Oil Pressure Gage Sensor
Courtesy of GENERAL MOTORS CORP.

23. Install the knock sensor (2).
24. Install the knock sensor retaining bolt (1). Tighten the knock sensor to 25 N.m (18 Lb ft).



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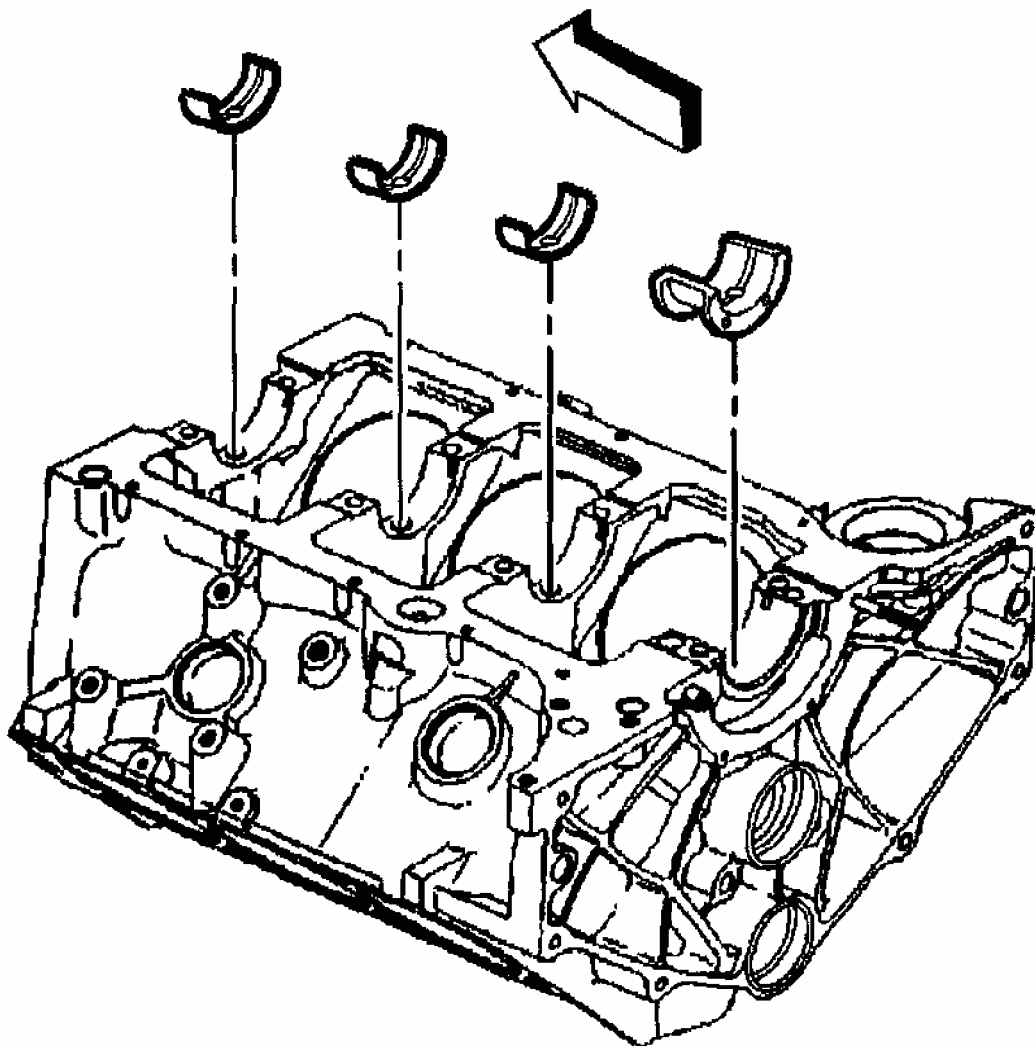
Fig. 283: Knock Sensor
Courtesy of GENERAL MOTORS CORP.

CRANKSHAFT & BEARINGS INSTALLATION

Tools Required

J 36660-A Torque Angle Meter

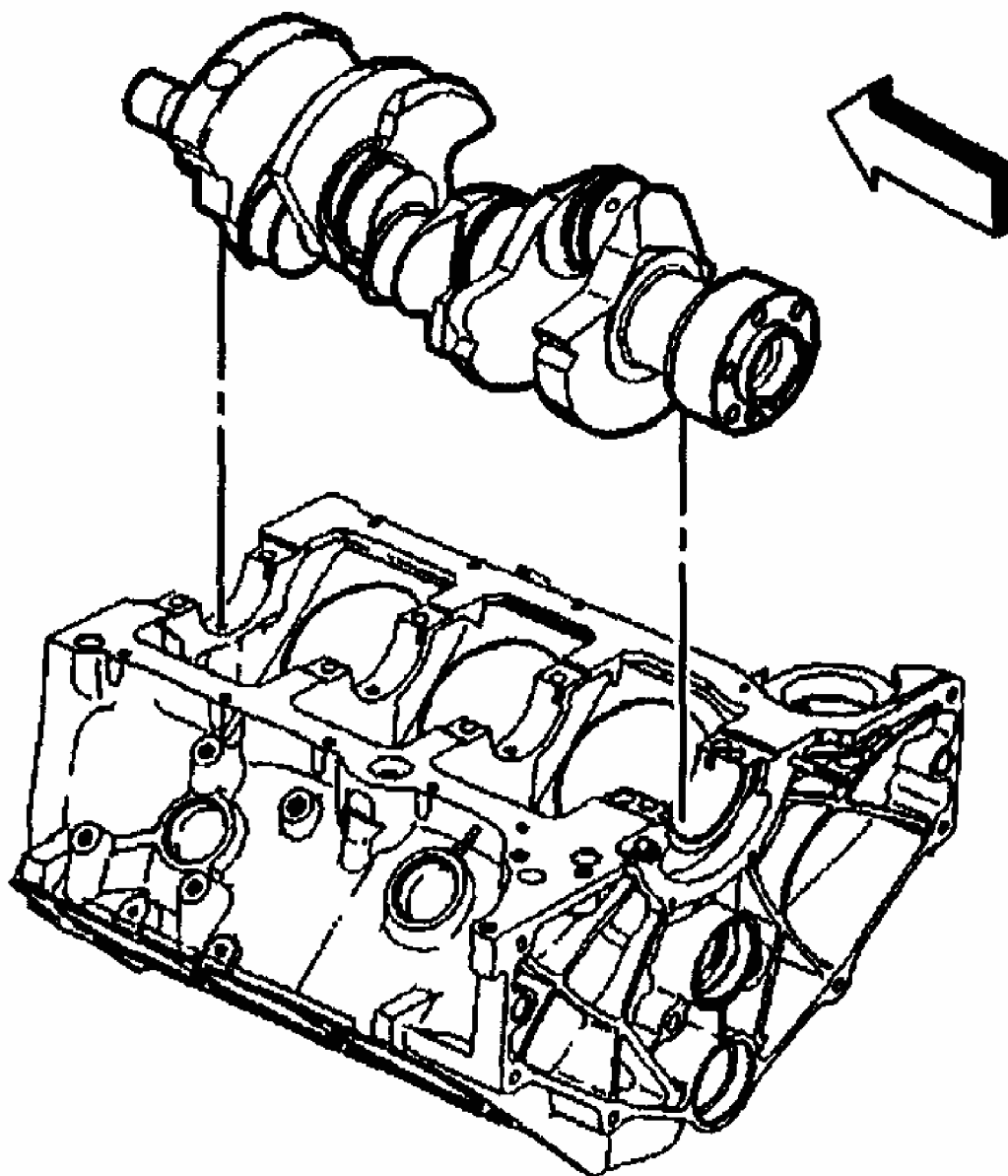
1. Install the crankshaft bearings into the engine block.
2. Apply clean engine oil to the crankshaft bearings.



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Fig. 284: Crankshaft Bearings
Courtesy of GENERAL MOTORS CORP.

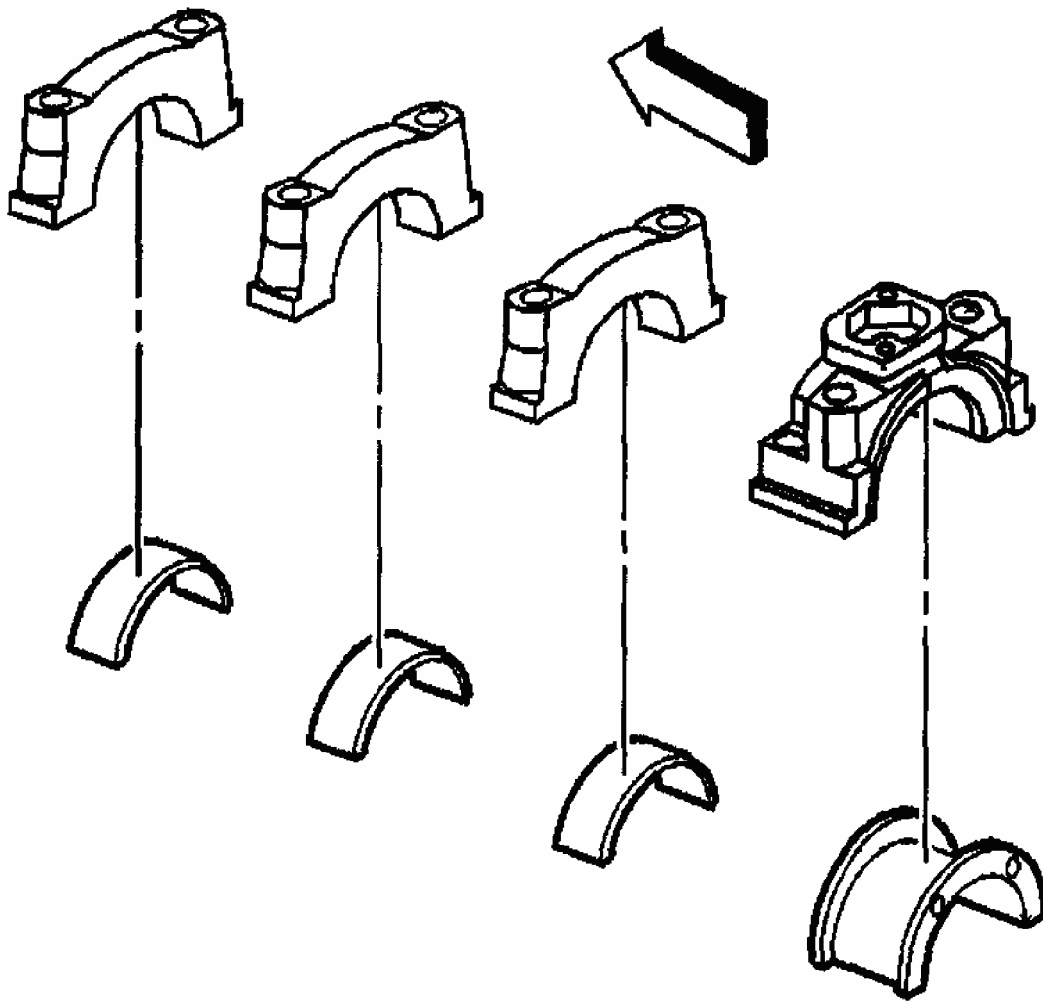
3. Apply clean engine oil to the crankshaft bearing journals.
4. Install the crankshaft.



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Fig. 285: Crankshaft Assembly
Courtesy of GENERAL MOTORS CORP.

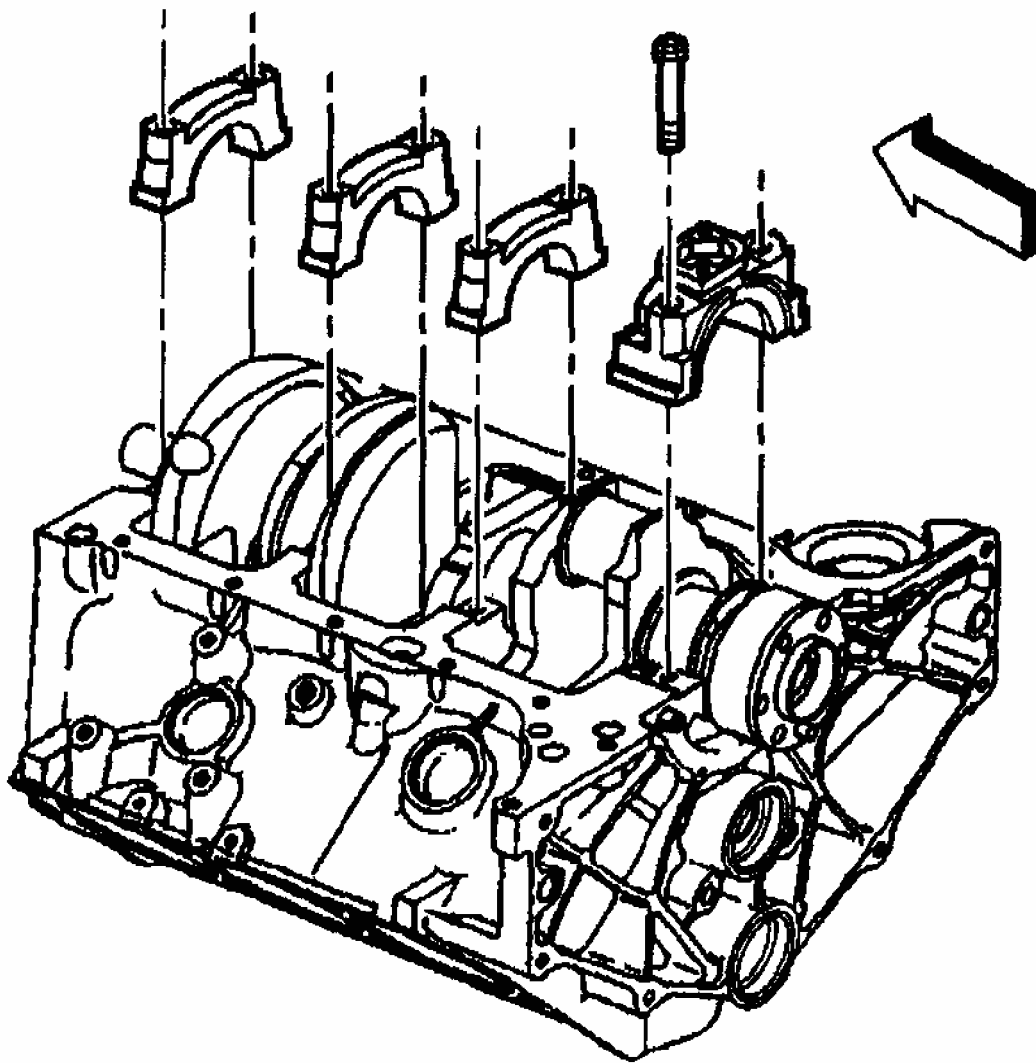
5. Install the crankshaft bearings into the crankshaft bearing caps.
6. Apply clean engine oil to the crankshaft bearings.



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Fig. 286: Crankshaft Bearings
Courtesy of GENERAL MOTORS CORP.

7. Install the crankshaft bearing caps in the original position and with the arrow on the crankshaft bearing caps in the direction of the front of the engine block.
8. Install the crankshaft bearing cap bolts until snug.
9. Thrust the crankshaft rearward in order to set and align the crankshaft thrust bearings and the crankshaft bearing caps.
10. Thrust the crankshaft forward in order to align the rear faces of the crankshaft thrust bearings.



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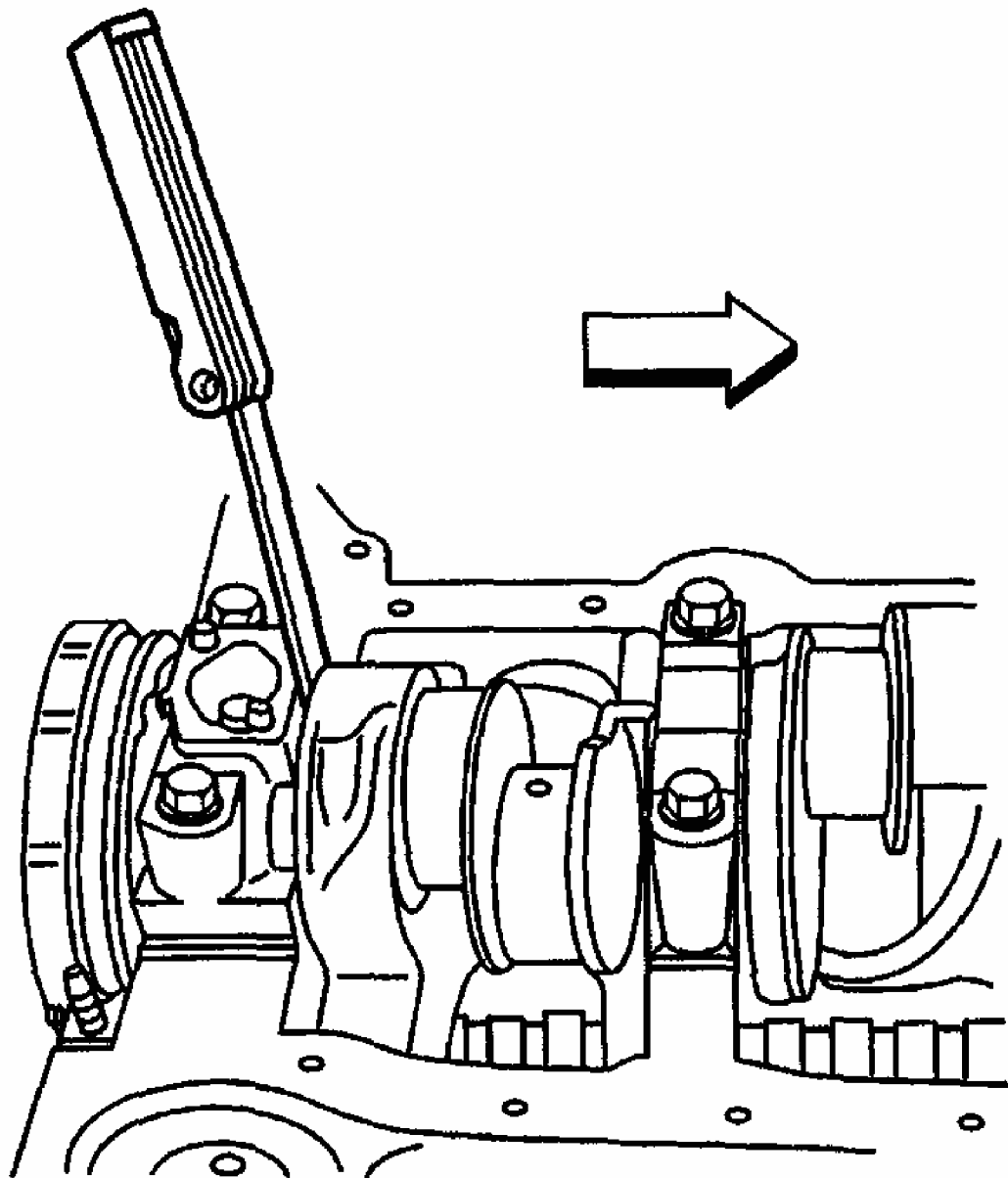
Fig. 287: Crankshaft Thrust Bearings
Courtesy of GENERAL MOTORS CORP.

11. Tighten the crankshaft bearing cap bolts.
 - 11.1. Tighten the crankshaft bearing cap bolts on the first pass to 20 N.m (15 Lb ft).
 - 11.2. Tighten the crankshaft bearing cap bolts on the final pass an additional 73 degrees using the J 36660-A.
12. Measure the crankshaft end play.
 - 12.1. Firmly thrust the crankshaft rearward, and then forward. This will align the crankshaft rear bearing thrust surfaces.

12.2. With the crankshaft pushed forward, insert a feeler gage between the crankshaft and the crankshaft rear bearing thrust surface to measure the clearance.

Specification

Crankshaft end play 0.05-0.20 mm (0.002-0.008 in)



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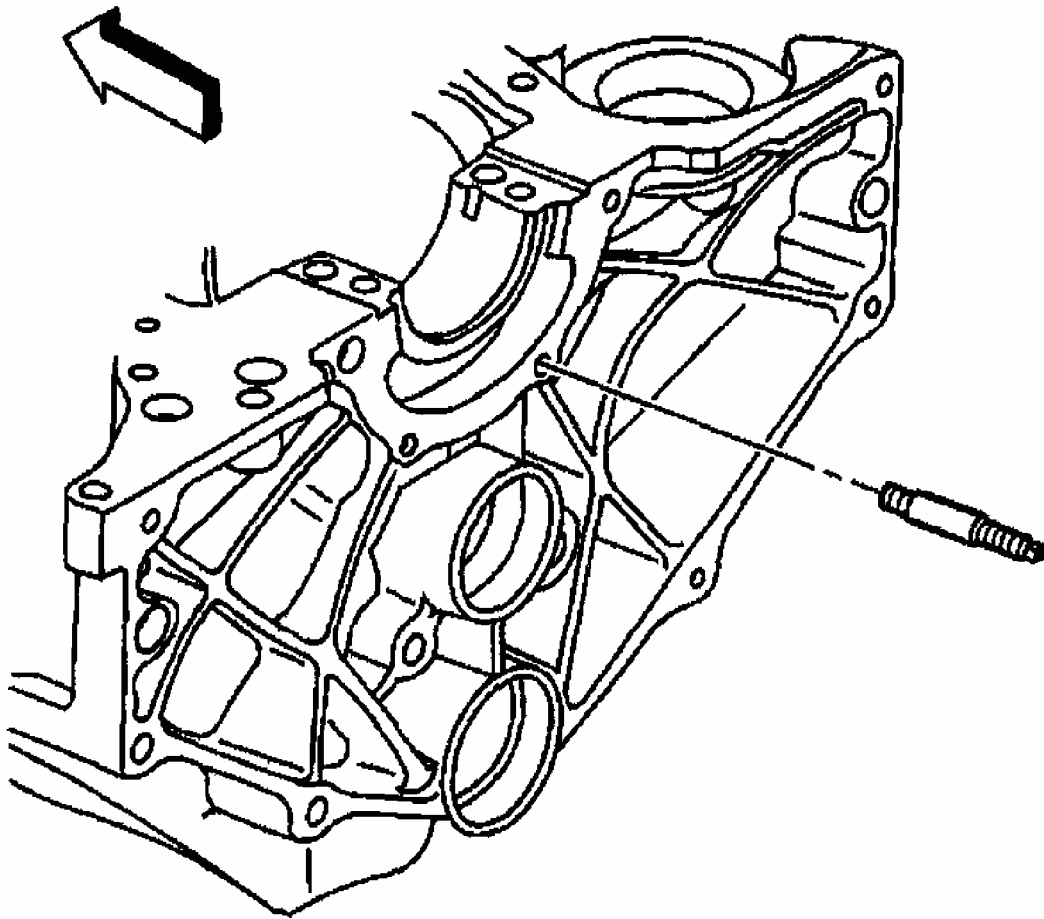
Fig. 288: Measuring Crankshaft End Play

Courtesy of GENERAL MOTORS CORP.

13. Rotate the crankshaft in order to check for binding. A bent crankshaft or lack of proper crankshaft bearing clearance may cause binding.
14. If the crankshaft does not turn freely, loosen the crankshaft bearing cap bolts on 1 crankshaft bearing cap at a time in order to determine the location of the binding. A lack of proper crankshaft bearing clearance may be caused by the following:
 - Burrs on the crankshaft bearing cap
 - Foreign material between the crankshaft bearing and the engine block
 - Foreign material between the crankshaft bearing and the crankshaft bearing cap
 - Damaged crankshaft bearing
 - Improper size crankshaft bearing

CRANKSHAFT REAR OIL SEAL & HOUSING INSTALLATION**Tools Required****J 35621-B** Rear Main Seal Installer

- Install the crankshaft rear oil seal housing retainer stud. Tighten the crankshaft rear oil seal housing retainer stud to 6 N.m (53 lb in).

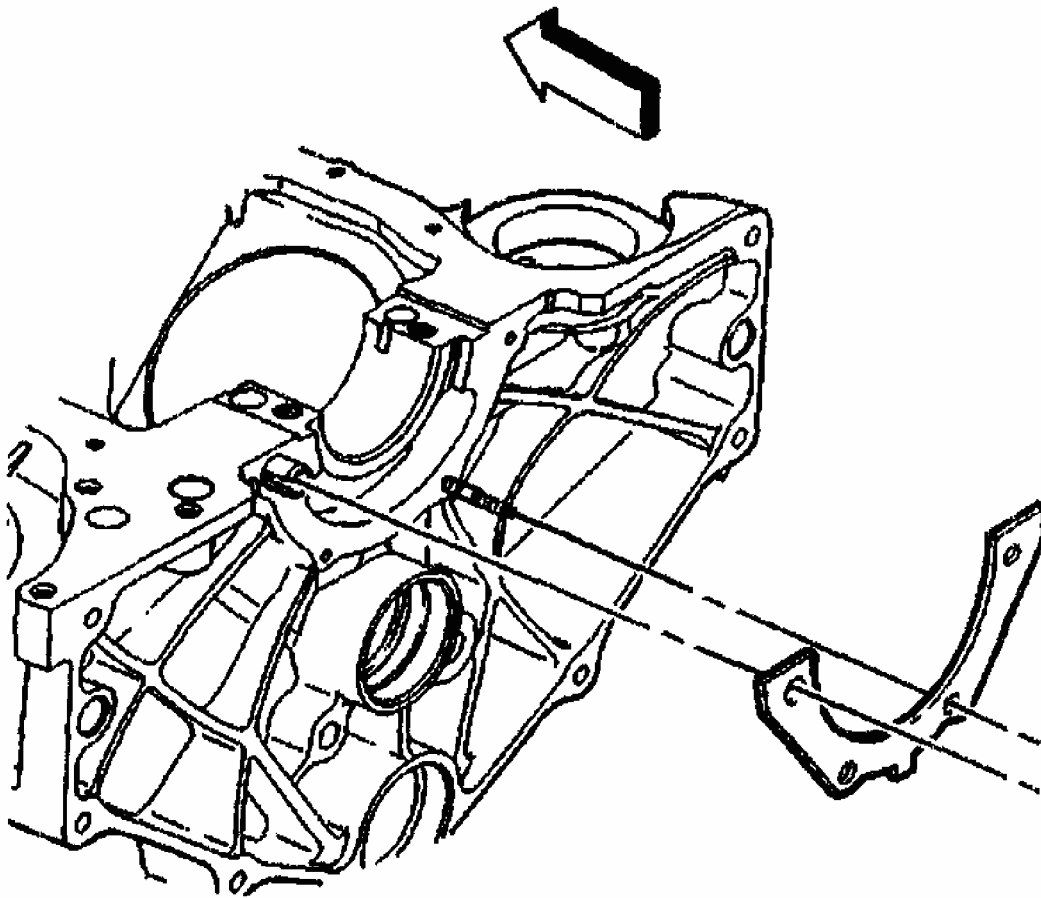


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Fig. 289: Crankshaft Rear Oil Seal Housing Retainer Stud
Courtesy of GENERAL MOTORS CORP.

Important: Always use a NEW crankshaft rear oil seal housing gasket when installing the crankshaft rear oil seal housing.

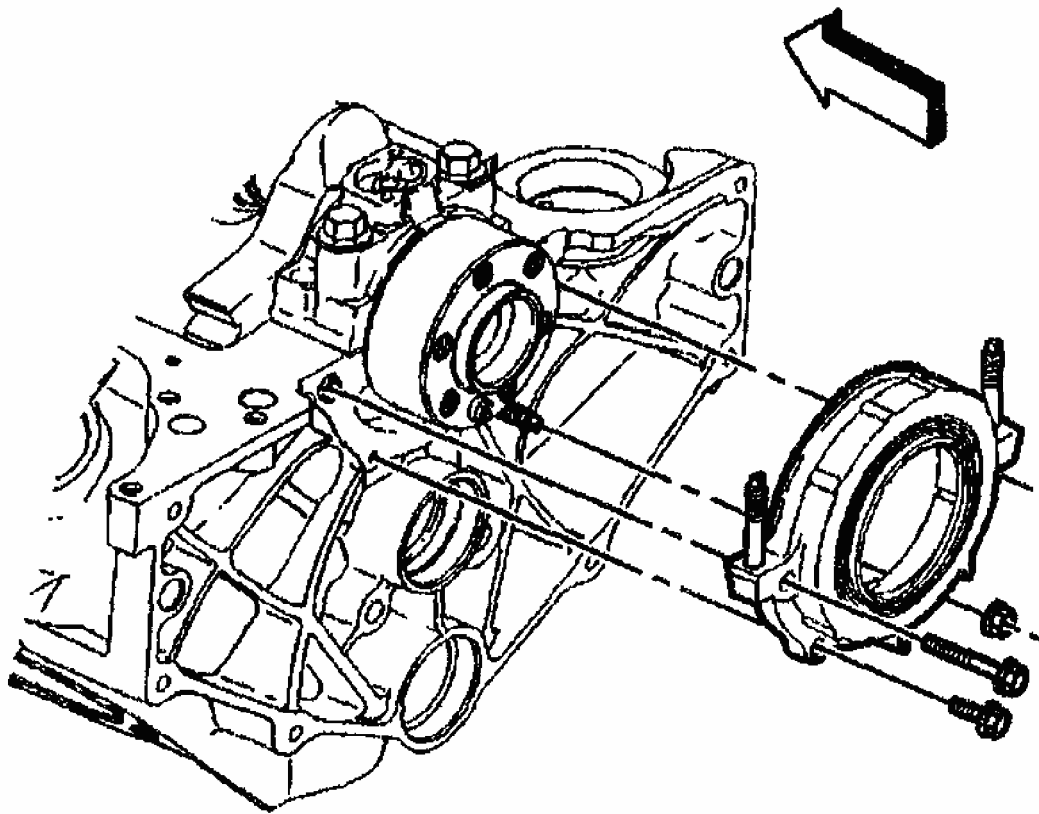
- Install the NEW crankshaft rear oil seal housing gasket.



G02503042

Fig. 290: Crankshaft Rear Oil Seal Housing Gasket
Courtesy of GENERAL MOTORS CORP.

- Install the crankshaft rear oil housing onto the crankshaft rear oil seal housing retainer stud.
- Install the crankshaft rear oil seal housing nut and bolts. Tighten the crankshaft rear oil seal housing nut and bolts to 12 N.m (106 lb in).



G02503043

Fig. 291: Crankshaft Rear Oil Seal Housing
Courtesy of GENERAL MOTORS CORP.

- Apply a small amount (2 to 3 drops) of clean engine oil to the bore of the crankshaft rear oil seal housing.
- Apply a small amount (2 to 3 drops) of clean engine oil to the outside diameter of the engine flywheel pilot flange.
- Apply a small amount (1 drop) of clean engine oil to the outside diameter of the flywheel locator pin.
- Apply a small amount (2 to 3 drops) of clean engine oil to the crankshaft seal surface.
- Inspect the J35621-B flange for imperfections that may damage the crankshaft rear oil seal. Minor imperfections may be removed with a fine grade emery cloth.

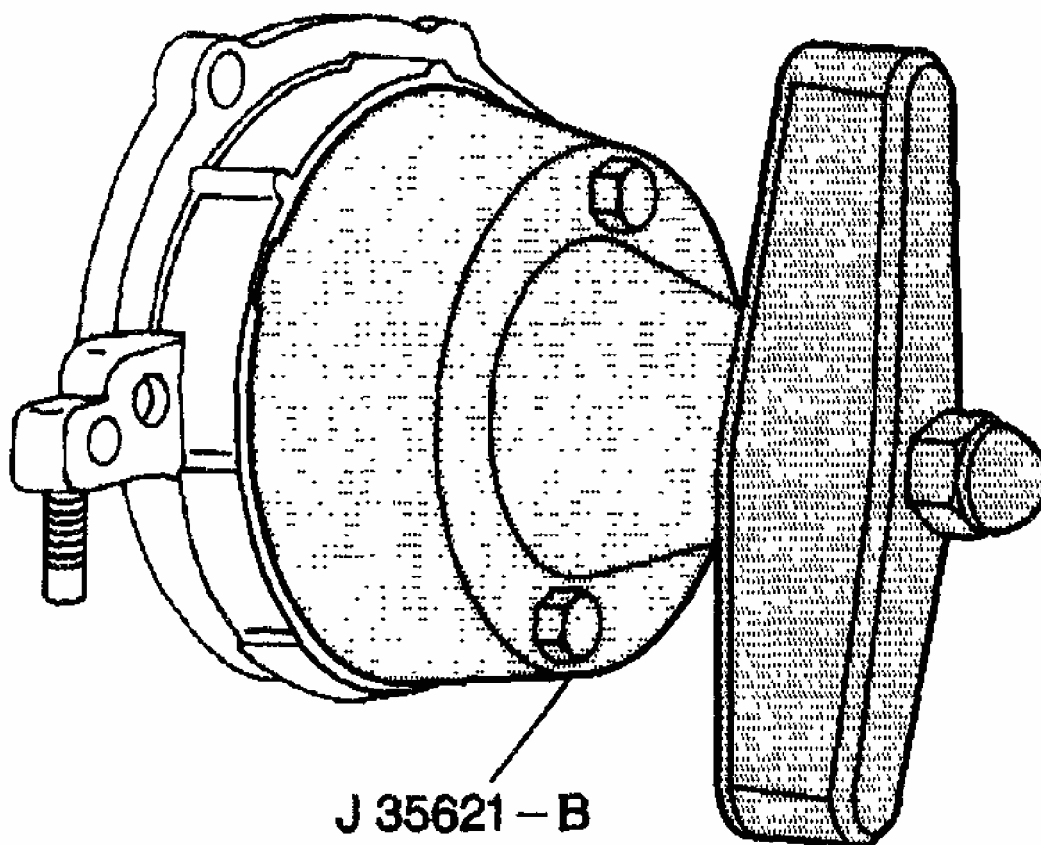
Important: DO NOT allow oil or any other lubricants to contact the seal lip surface of the crankshaft rear oil seal.

- Remove the sleeve from the crankshaft rear oil seal.
- Apply a small amount (2 to 3 drops) of clean engine oil to the outside diameter of the

crankshaft rear oil seal.

- Install the crankshaft rear oil seal onto the **J 35621-B**.
- Install the **J 35621-B** onto the rear of the crankshaft and hand tighten the tool bolts until snug.

NOTE: Proper alignment of the crankshaft rear oil seal is critical. Install the crankshaft rear oil seal near to flush and square to the crankshaft rear oil seal housing. Failing to do so may cause the crankshaft rear oil seal or the crankshaft rear oil seal installation tool to fail.



G02503044

Fig. 292: Installing Crankshaft Rear Oil Seal
Courtesy of GENERAL MOTORS CORP.

- Install the crankshaft rear oil seal onto the crankshaft and into the crankshaft rear oil seal housing.

14.1. Turn the J 35621-B wing nut clockwise until the crankshaft rear oil seal is

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

installed near to flush and square to the crankshaft rear oil seal housing. Increased resistance will be felt when the crankshaft rear oil seal has reached the bottom of the crankshaft rear oil seal housing bore.

14.2. Turn the J35621-Swing nut counterclockwise to release the J35621-B from the crankshaft rear oil seal.

- Remove the J 35621-B from the crankshaft.
- Wipe off any excess engine oil with a clean rag.

PISTON, CONNECTING ROD & BEARING INSTALLATION

Tools Required

- **J 5239** Connecting Rod Bolt Guide Set
- **J 8037** Ring Compressor
- **J 8087** Cylinder Bore Gage
- **J 36660-A** Torque Angle Meter

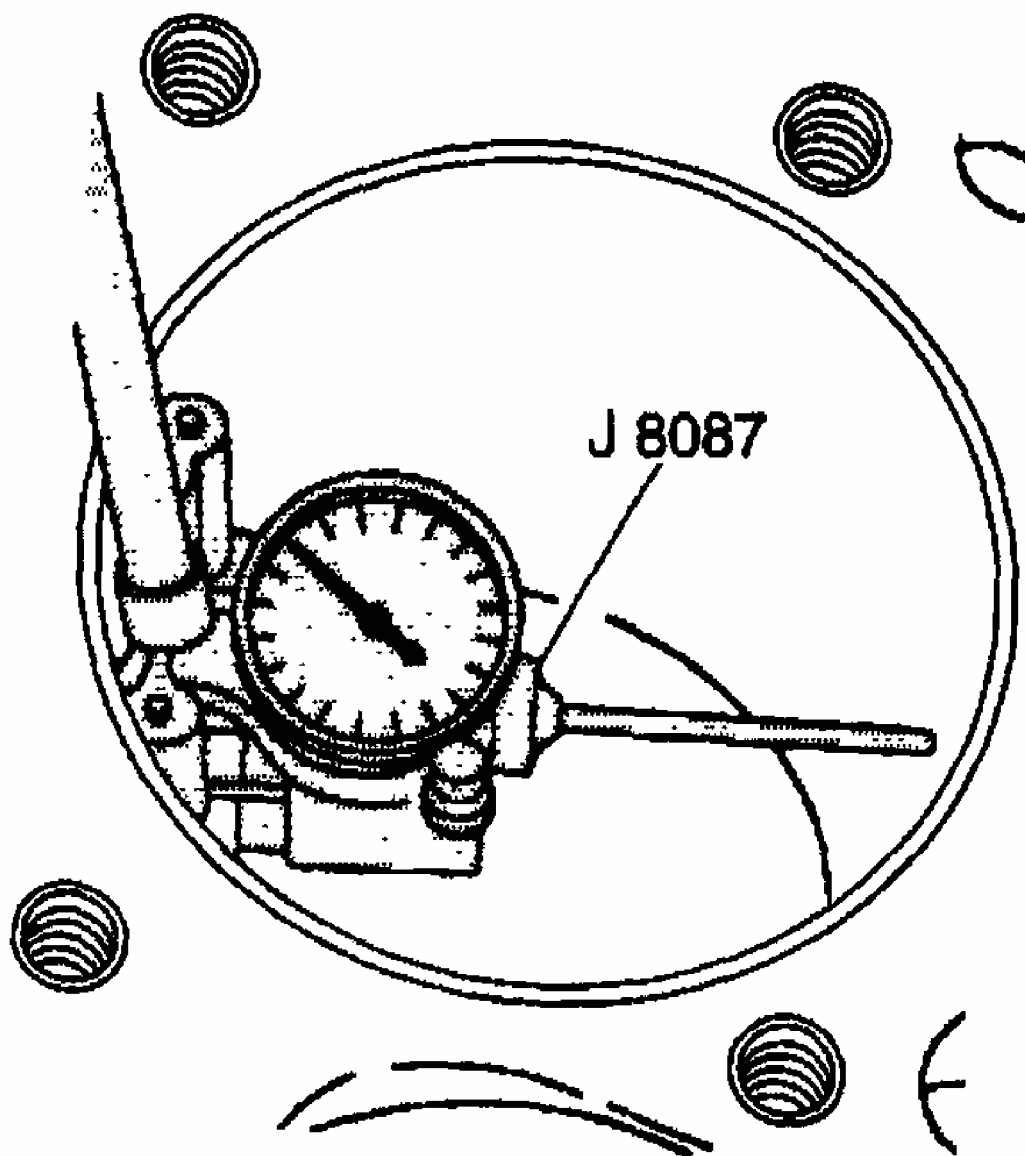
Piston Selection

Important: Measurements of all components should be taken with the components at normal room temperature.

For proper piston fit, the engine block cylinder bores should not have excessive wear or taper.

A used piston and piston pin set may be reinstalled if, after cleaning and inspection, the piston and piston pin are within specifications.

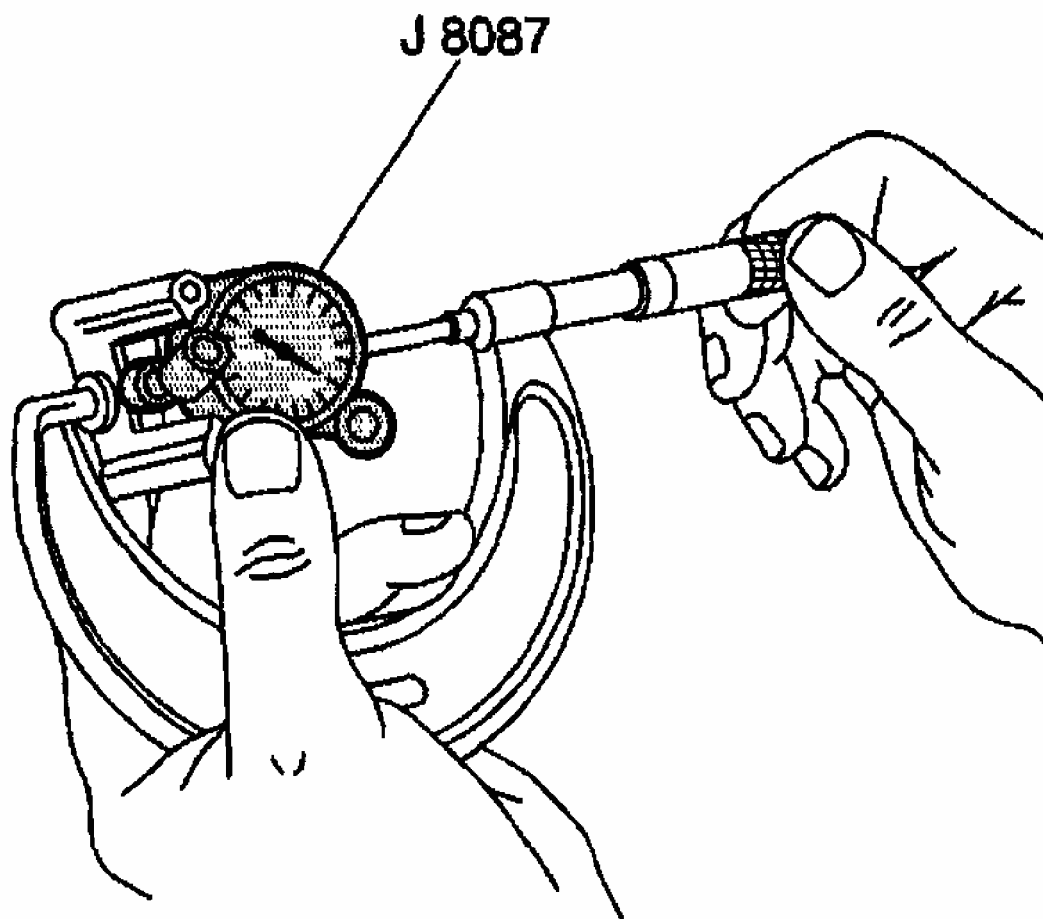
1. Use the **J 8087** in order to measure the cylinder bore diameter. Measure at a point 64 mm (2.5 in) from the top of the cylinder bore and 90 degrees to the crankshaft centerline.



G02503045

Fig. 293: Measuring Cylinder Bore Diameter
Courtesy of GENERAL MOTORS CORP.

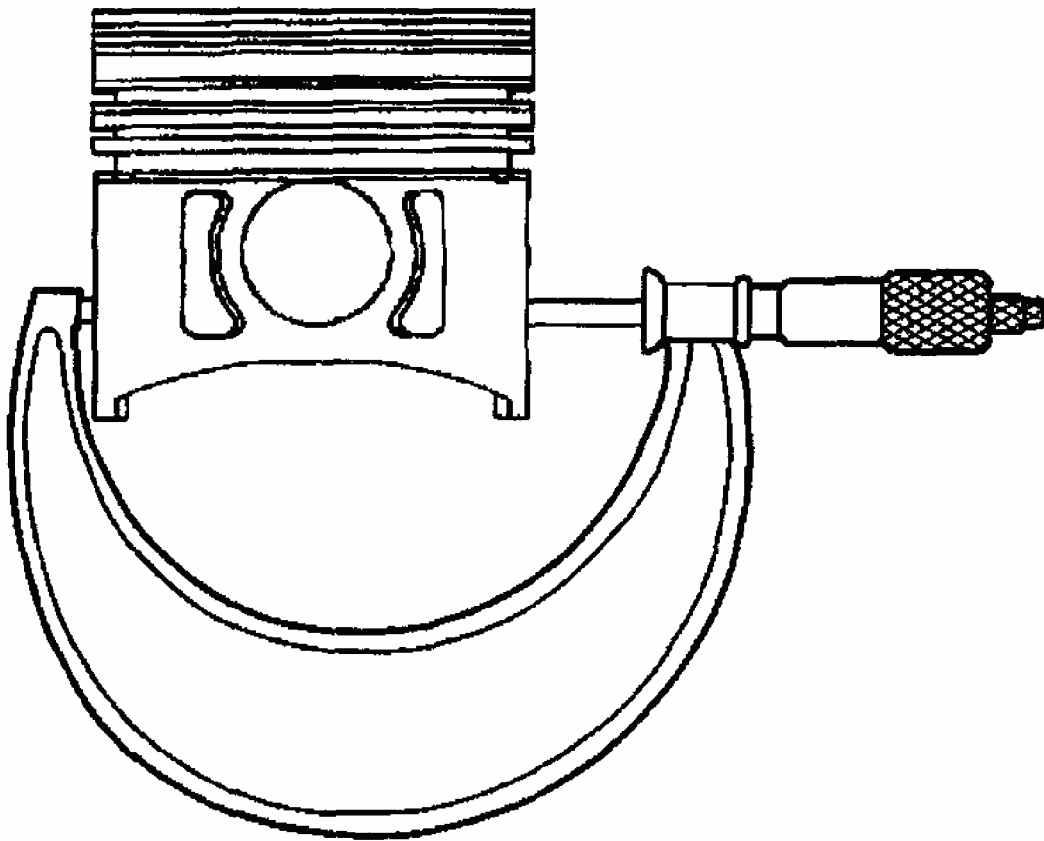
2. Measure the J 8087 with a micrometer and record the reading.



G02503046

Fig. 294: Measuring Cylinder Bore Gage
Courtesy of GENERAL MOTORS CORP.

3. With a micrometer or caliper at a right angle to the piston pin bore, measure the piston 11 mm (0.433 in) from the bottom of the skirt.



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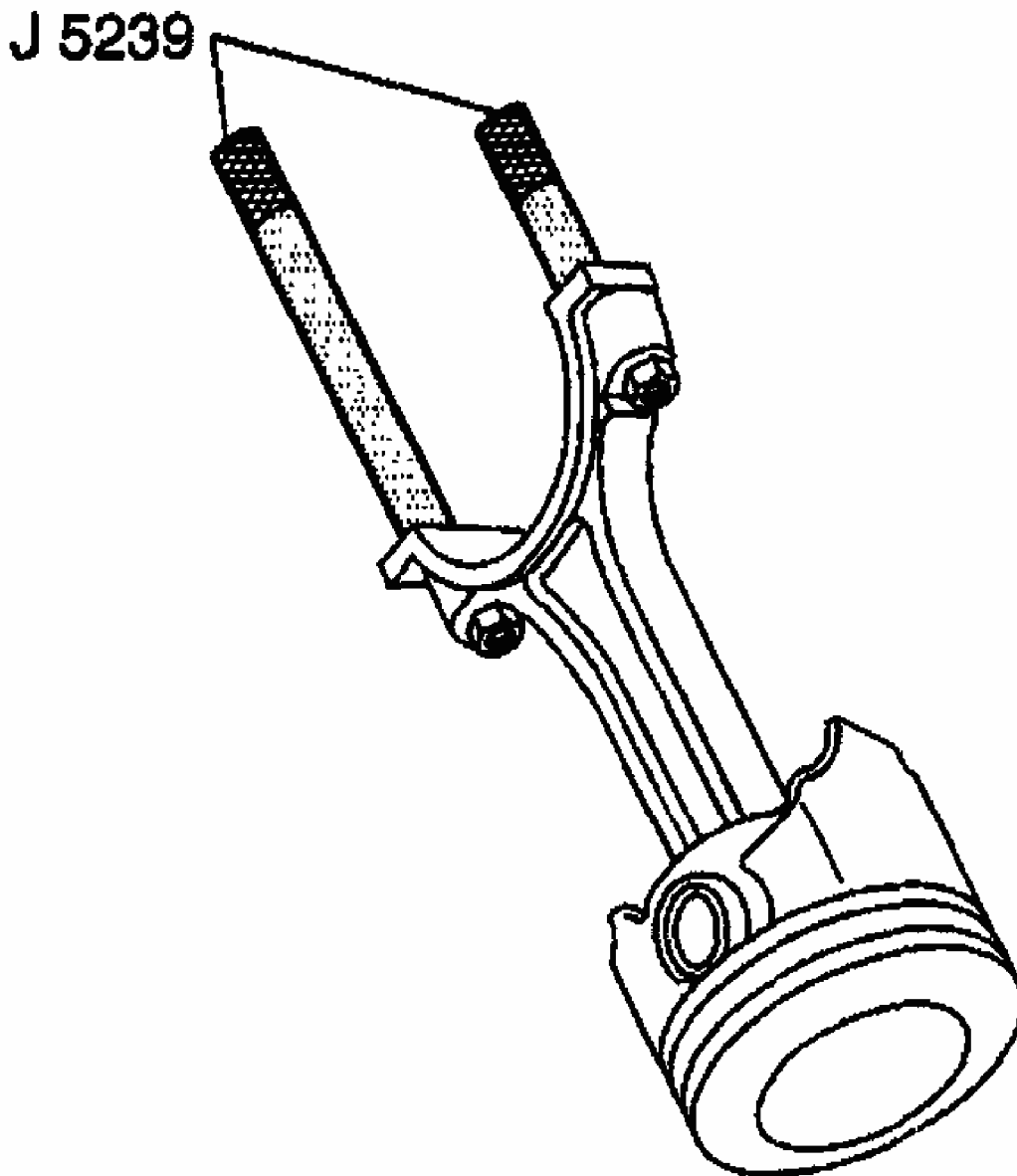
Fig. 295: Measuring Piston Diameter
Courtesy of GENERAL MOTORS CORP.

4. Subtract the piston diameter from the cylinder bore diameter in order to determine piston-to-bore clearance. Refer to **Engine Mechanical Specifications** .
5. If the proper clearance cannot be obtained, then select another piston and measure the clearances. If the proper fit cannot be obtained, the cylinder bore may require honing or boring.
6. When the piston-to-cylinder bore clearance is within specifications, permanently mark the top of the piston for installation into the proper cylinder.

Installation Procedure

1. Apply clean engine oil to the following components:
 - The piston
 - The piston rings
 - The cylinder bore

- The bearing surfaces
2. Install the **J 5239** onto the connecting rod bolts.



G02503048

Fig. 296: Connecting Rod Bolt Guide Set
Courtesy of GENERAL MOTORS CORP.

3. Install the **J 8037** onto the piston and compress the piston rings.

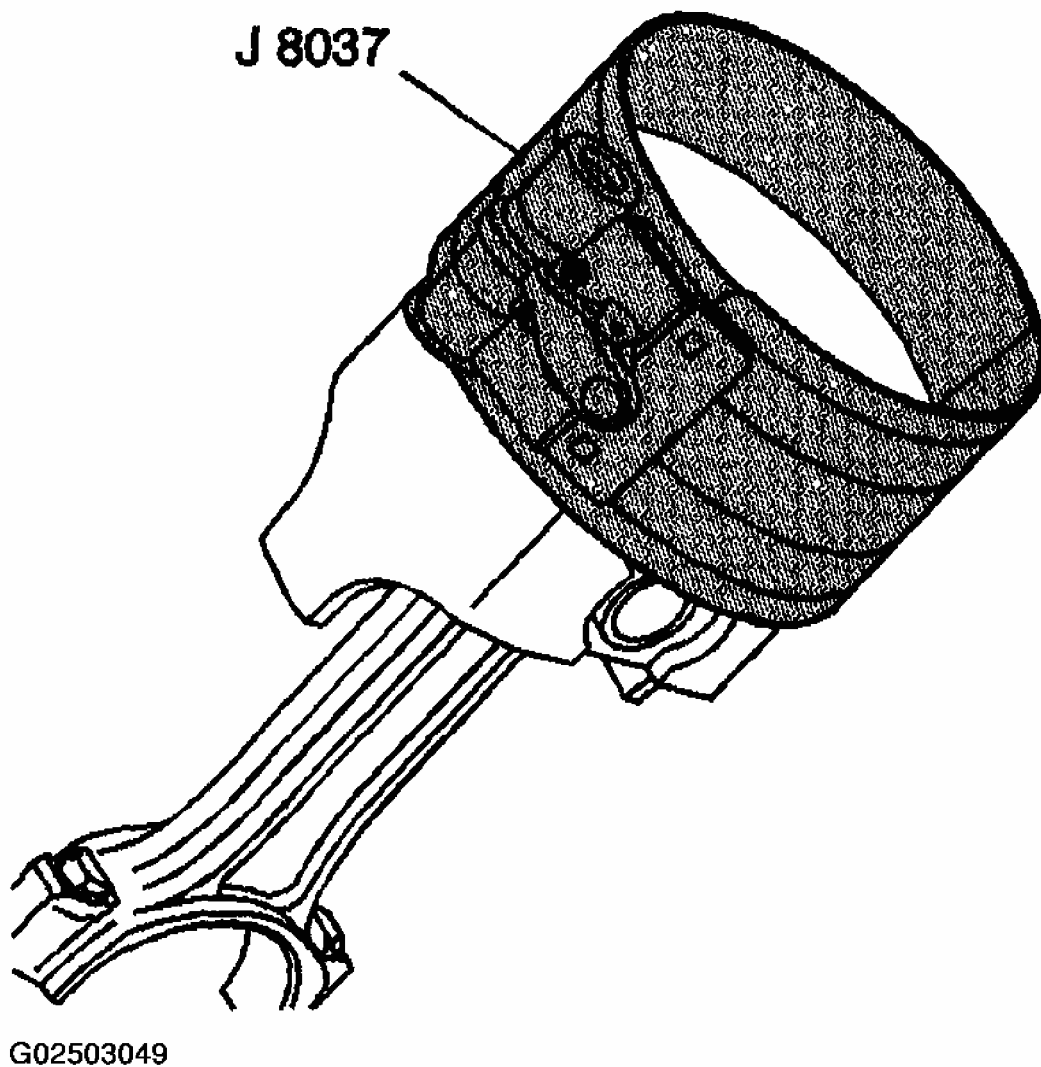


Fig. 297: Compressing Piston Rings
Courtesy of GENERAL MOTORS CORP.

Important: The mark on the top of the piston must face the front of the engine block.

When assembled, the flanges on the connecting rod and connecting rod cap should face to the front of the engine block on the left bank, and to the rear of the engine block on the right bank.

4. Install the piston and connecting rod assembly, and the J 8037 into the proper cylinder bore.

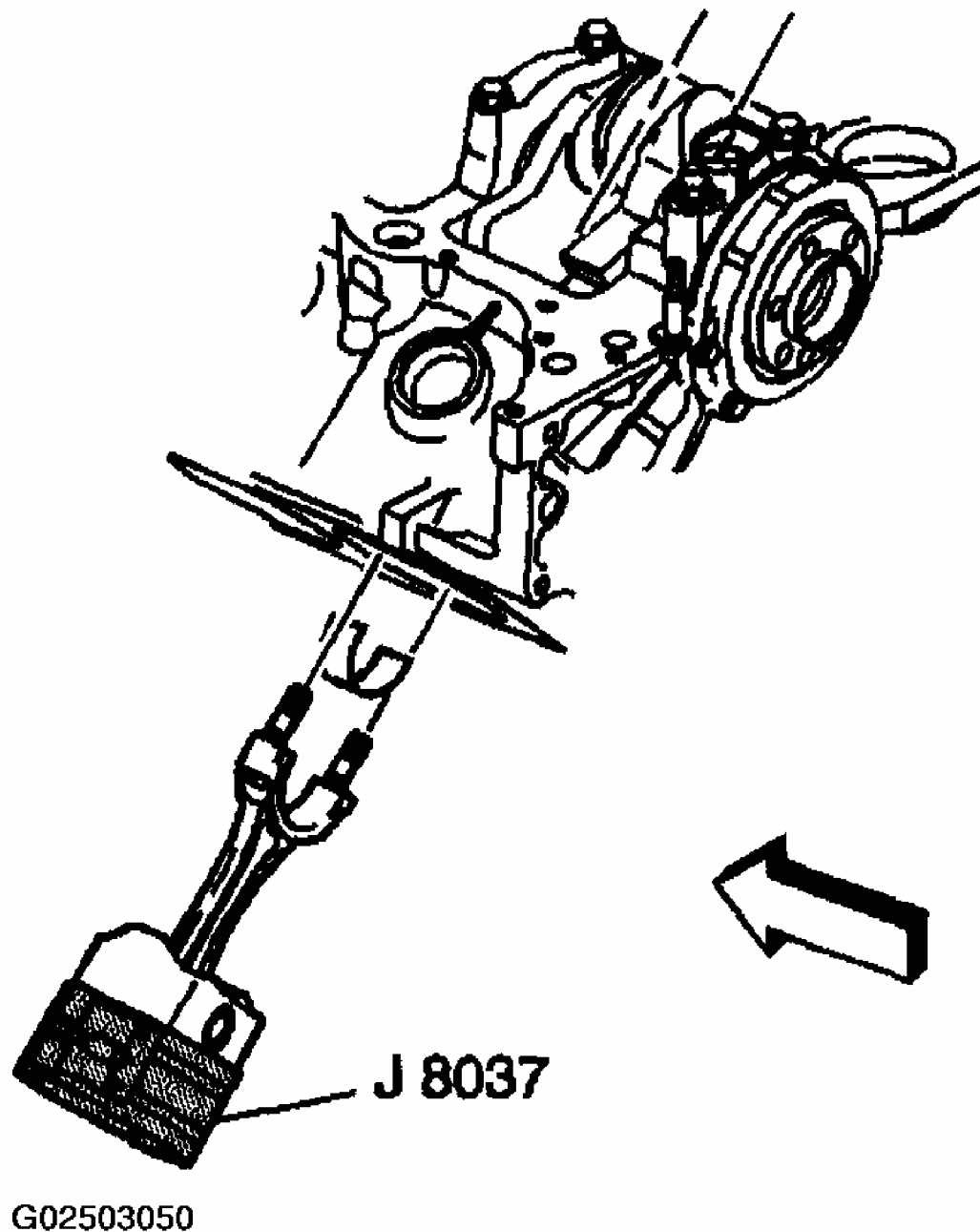
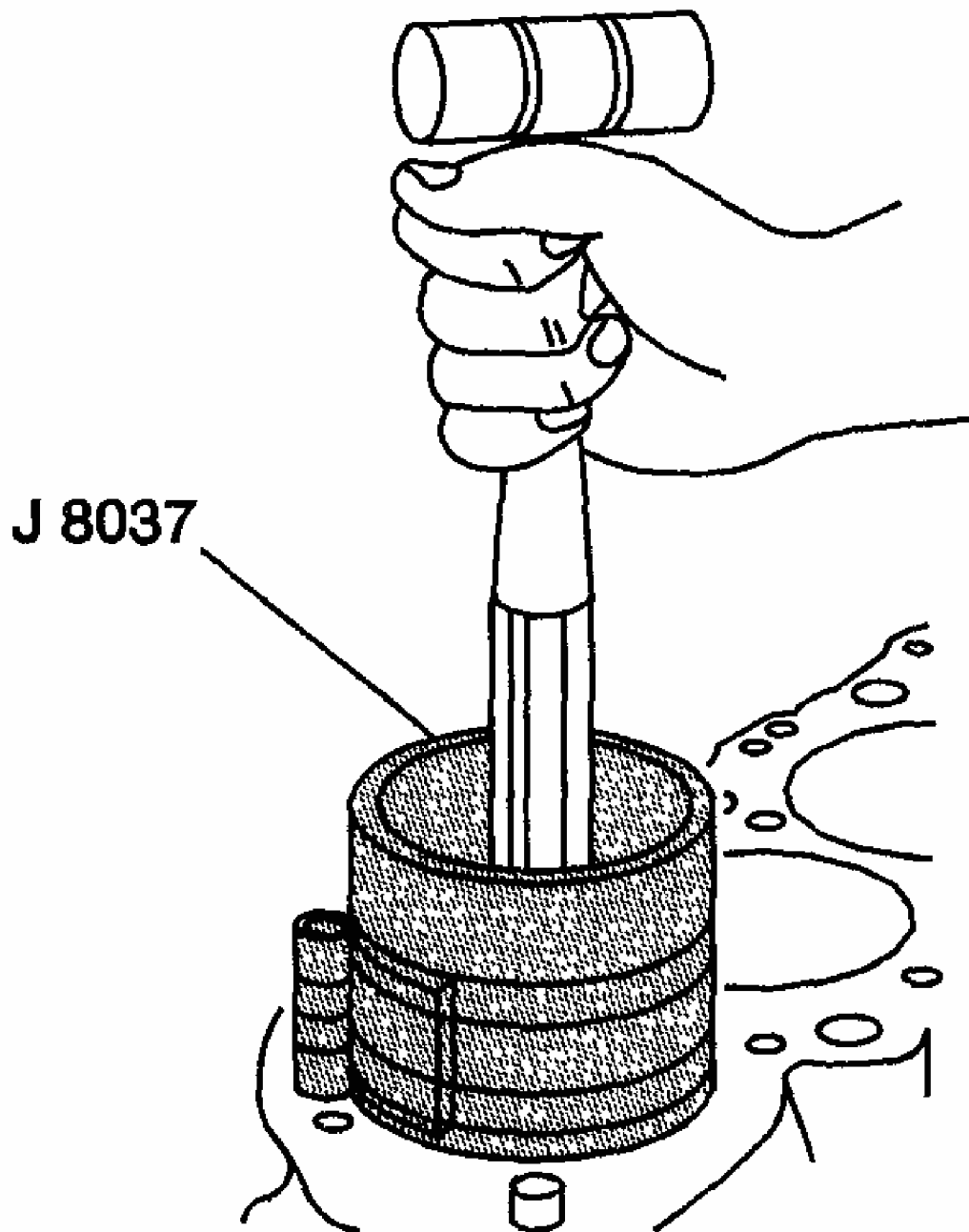


Fig. 298: Installing Piston & Connecting Rod Assembly
Courtesy of GENERAL MOTORS CORP.

5. Use the J 8037 and the J 5239 and lightly tap the top of the piston with a wooden hammer handle.
 - 5.1. Hold the J 8037 firmly against the engine block until all of the piston rings have entered the cylinder bore.

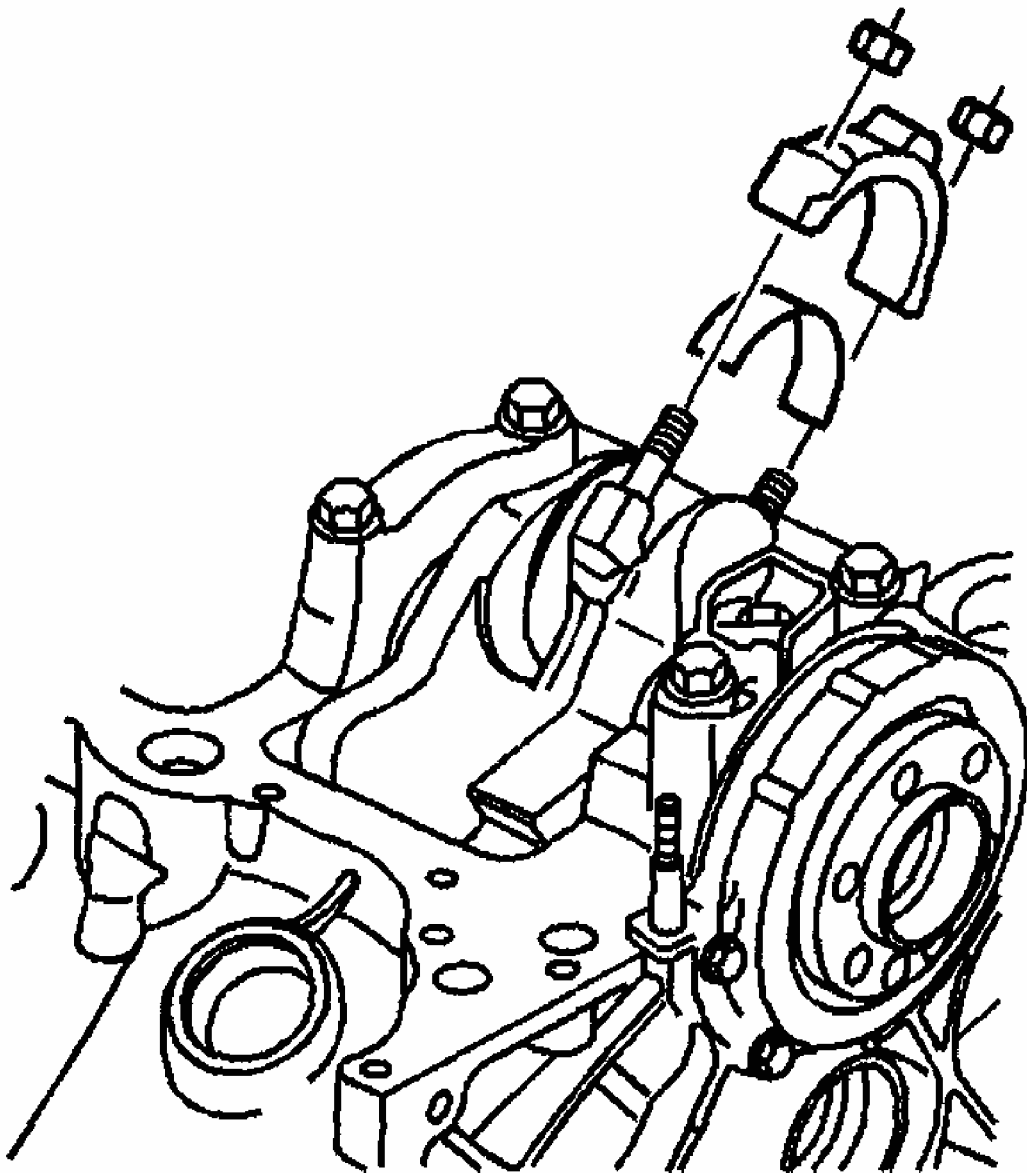
5.2. Use the J 5239 in order to guide the connecting rod onto the crankshaft journal.



G02503051

Fig. 299: Installing Piston Into Engine Block
Courtesy of GENERAL MOTORS CORP.

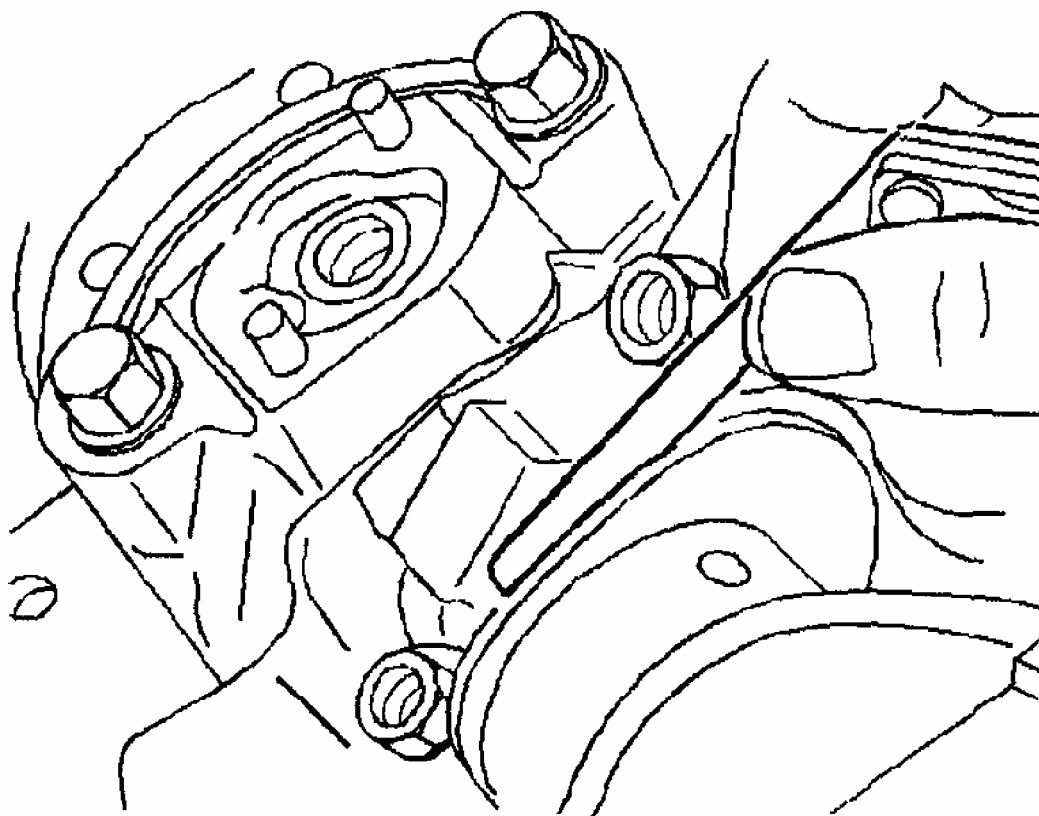
6. Remove the **J 5239** .
7. Install the connecting rod caps, bearings, and nuts.
 - 7.1. Tighten the nuts evenly on the first pass to 27 N.m (20 Lb ft).
 - 7.2. Use the **J 36660-A** in order to tighten the nuts on the final pass an additional 70 degrees.



G02503053

Fig. 300: Installing Connecting Rod Caps, Bearings & Nuts
Courtesy of GENERAL MOTORS CORP.

8. After the piston and connecting rod assemblies have been installed, lightly tap each connecting rod assembly, parallel to the crankpin, in order to ensure that the connecting rods have side clearance.
9. Use a feeler gage or a dial indicator to measure the connecting rod side clearance between the connecting rod caps. The connecting rod side clearance should be 0.15-0.44 mm (0.006-0.017 in).



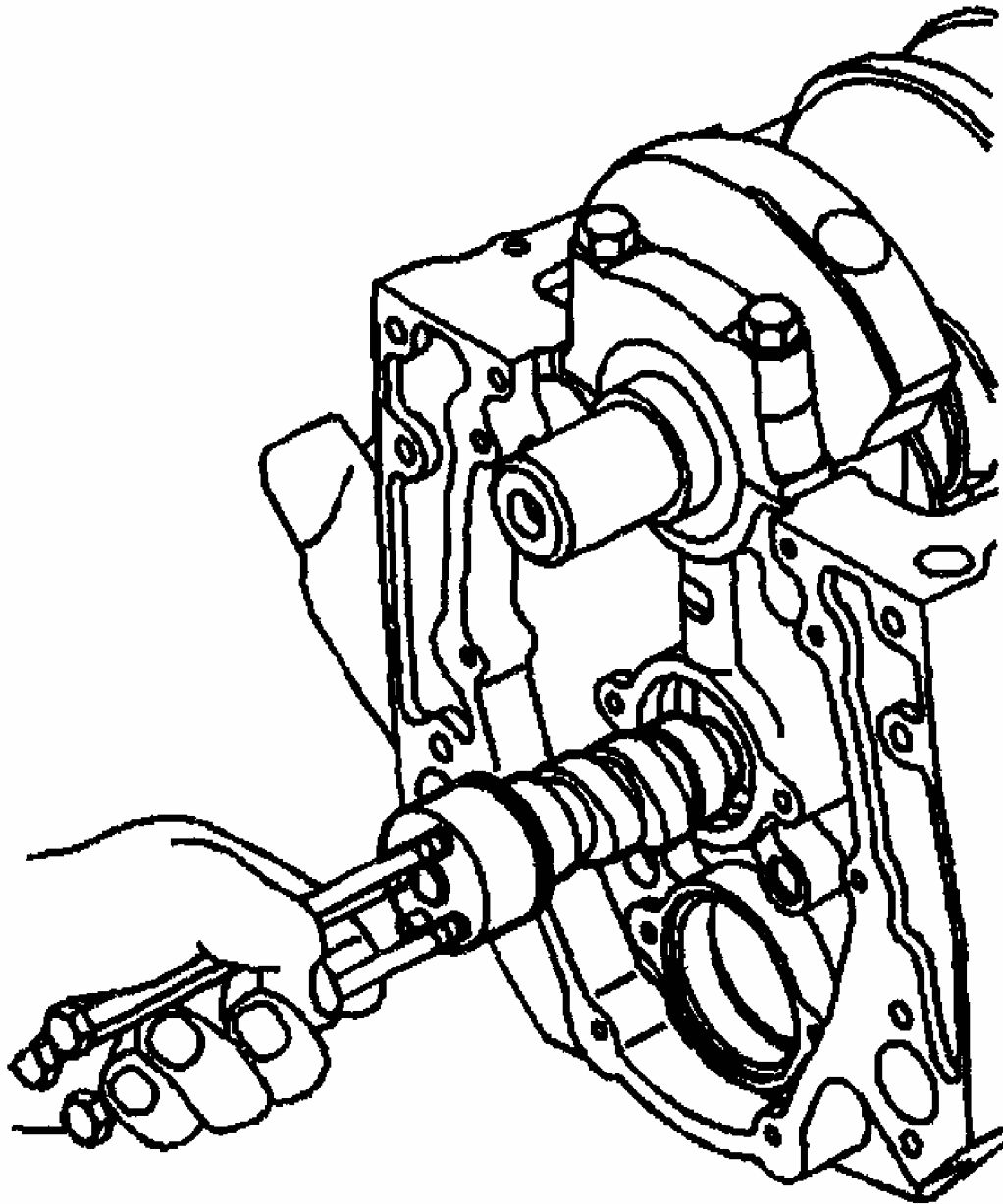
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Fig. 301: Measuring Connecting Rod Side Clearance
Courtesy of GENERAL MOTORS CORP.

CAMSHAFT INSTALLATION

1. Apply clean engine oil GM P/N United States 12345610, GM P/N Canada 993193, or equivalent, or engine oil supplement GM P/N United States 1052367, GM P/N Canada 992367, or equivalent, to the following components:
 - The engine camshaft lobes
 - The camshaft bearing journals
 - The camshaft bearings

- The distributor drive gear



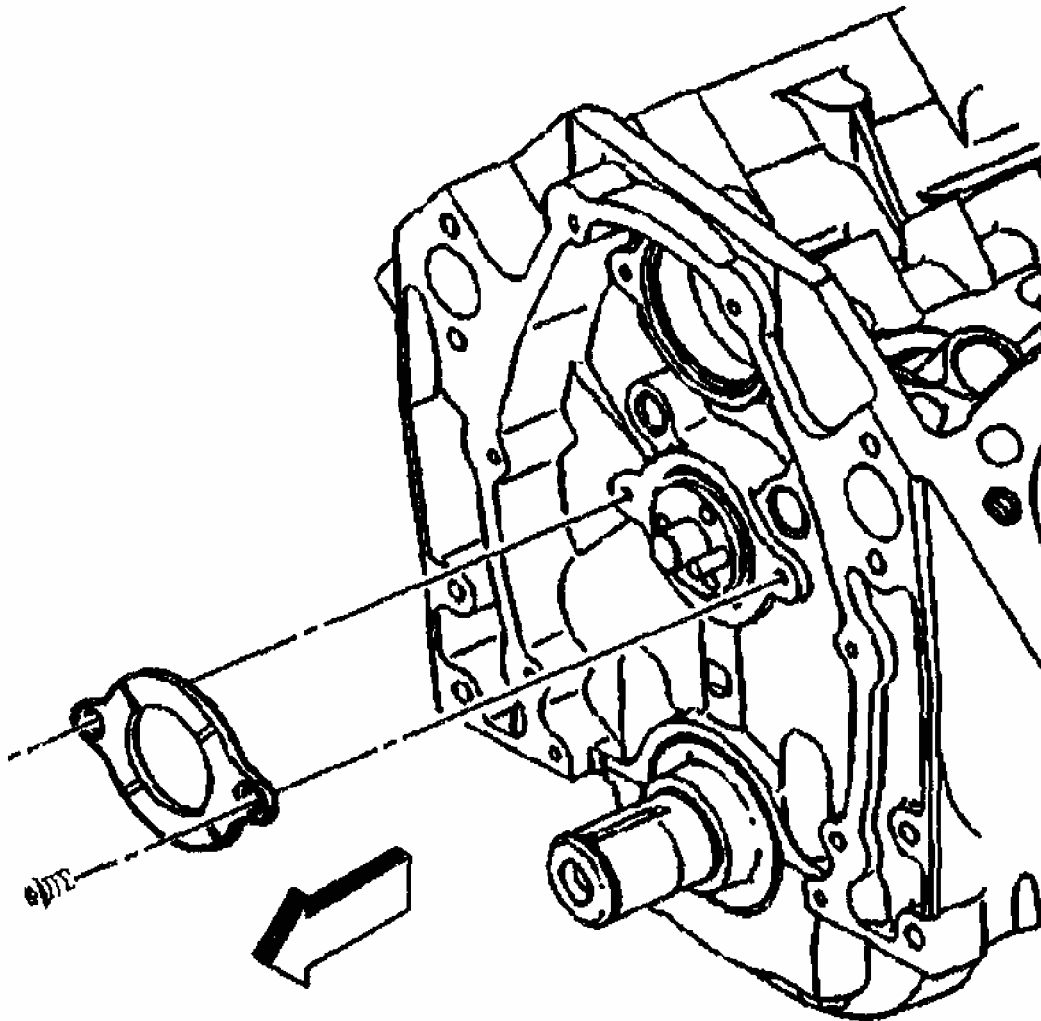
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Fig. 302: Installing Camshaft
Courtesy of GENERAL MOTORS CORP.

2. Install three 5/16-18 x 4.0 inch bolts into the engine camshaft front bolt holes.

NOTE: All camshaft journals are the same diameter, so care must be used in removing or installing the camshaft to avoid damage to the camshaft bearings.

3. Use the bolts as a handle in order to install the engine camshaft.
4. Remove the 3 bolts from the front of the engine camshaft.
5. If reusing the fasteners, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the camshaft retainer bolts.
6. Install the camshaft retainer and bolts. Tighten the camshaft retainer bolts to 12 N.m (106 lb in).



G02503056

Fig. 303: Camshaft Retainer & Bolts
Courtesy of GENERAL MOTORS CORP.

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

BALANCE SHAFT INSTALLATION

Tools Required

- **J 8092** Universal Driver Handle
- **J 36660-A** Torque Angle Meter
- **J 36996** Balance Shaft Installer

Important: The balance shaft and the balance shaft front bearing are serviced only as an assembly. Do not remove the balance shaft front bearing from the balance shaft.

1. Apply clean engine oil GM P/N United States 12345610, GM P/N Canada 993193, or equivalent, to the balance shaft front bearing.
2. Use the **J 36996** and the **J 8092** in order to install the balance shaft.

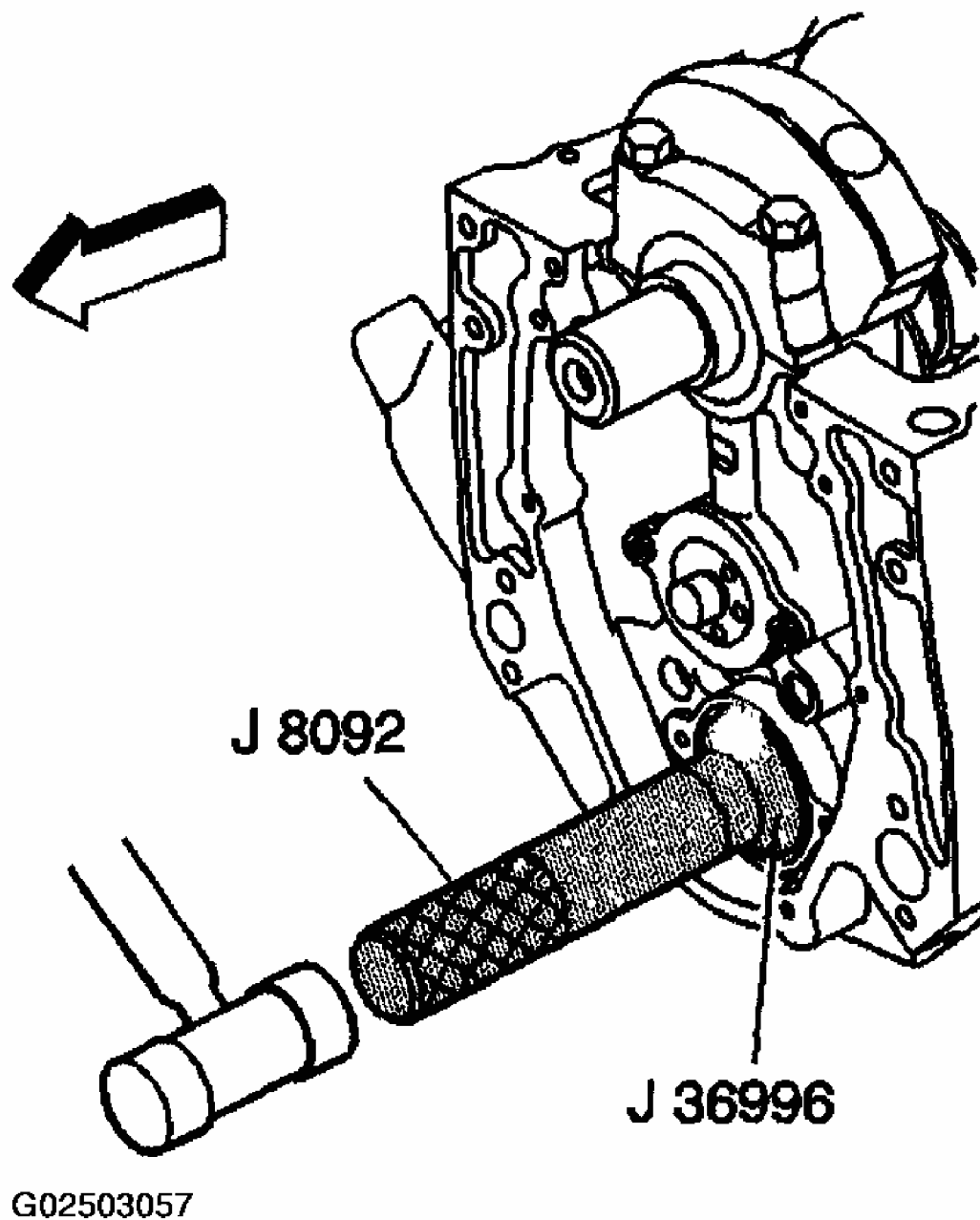
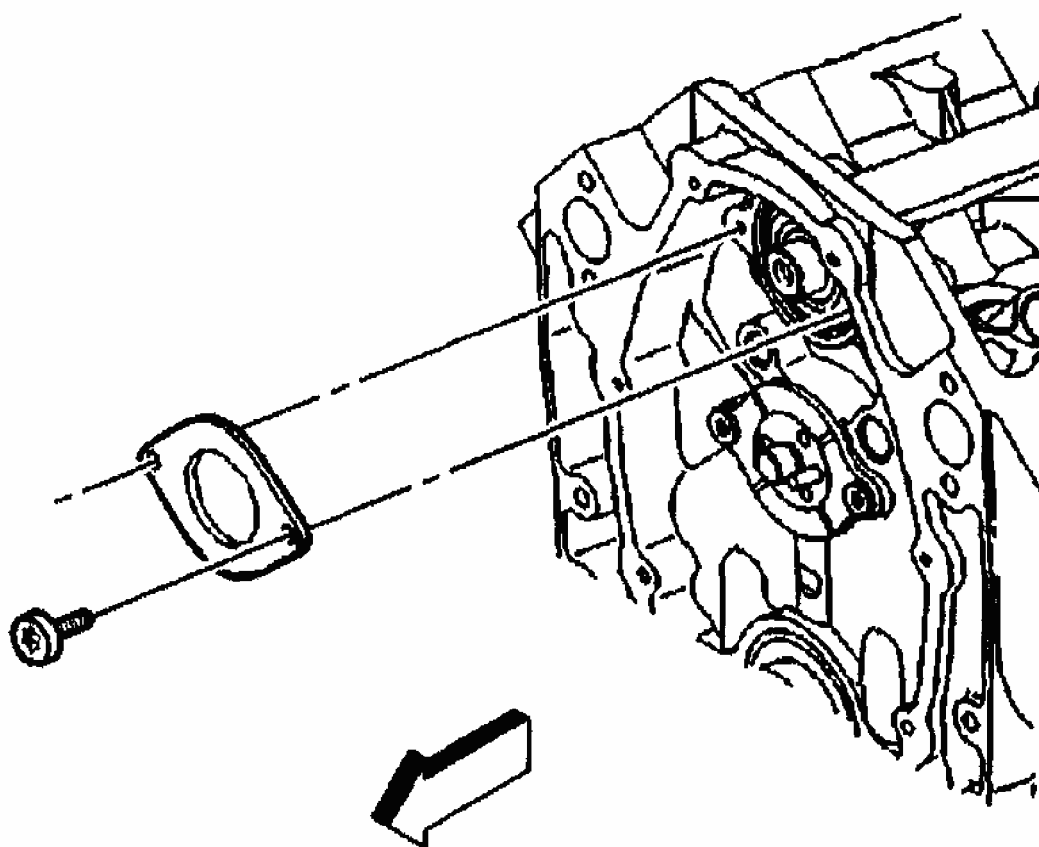


Fig. 304: Installing Balance Shaft
Courtesy of GENERAL MOTORS CORP.

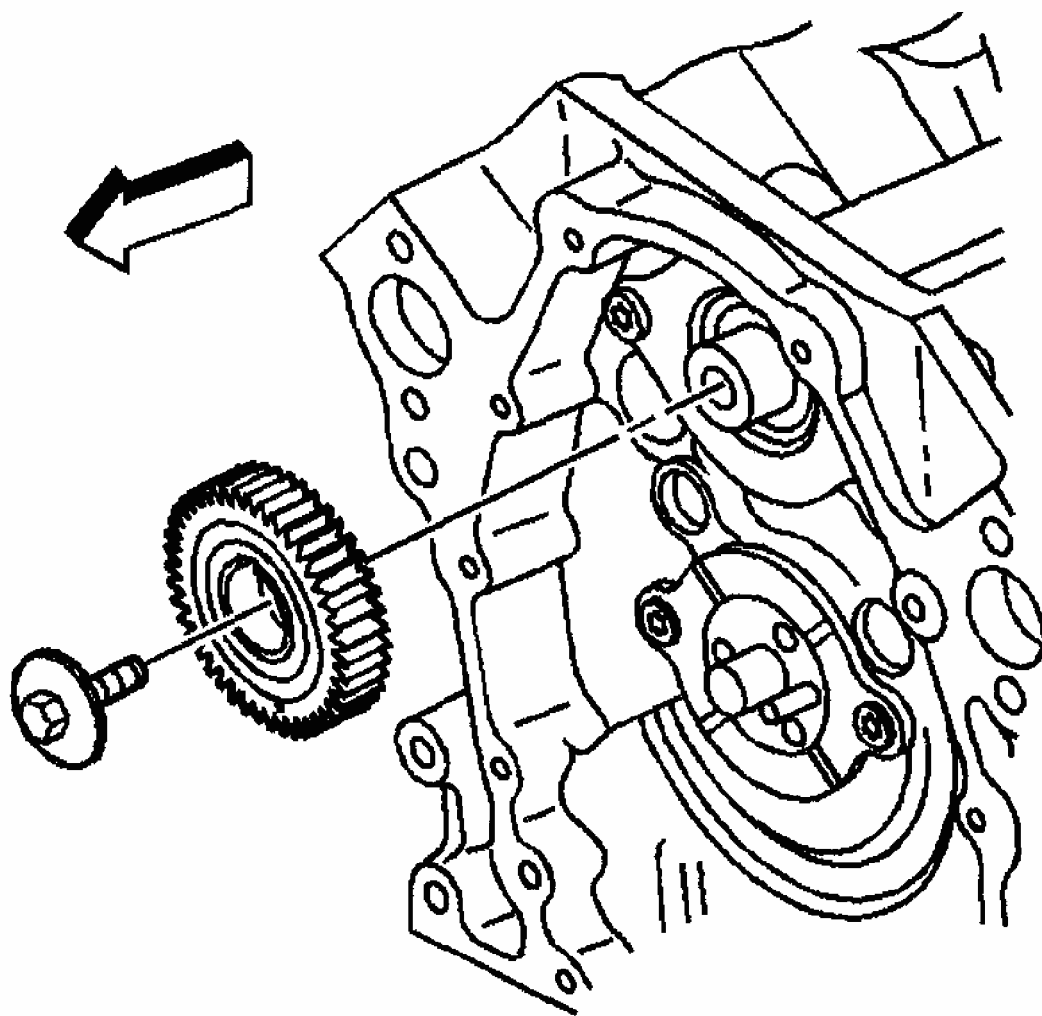
3. Install the balance shaft retainer and bolts. Tighten the bolts to 12 N.m (106 lb in).



G02503058

Fig. 305: Balance Shaft Retainer & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the balance shaft driven gear onto the balance shaft.
5. If reusing the fastener, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the balance shaft driven gear bolt.
6. Install the balance shaft driven gear bolt.
 - 6.1. Use a wrench to secure the balance shaft. Place the wrench onto the balance shaft near to the balance shaft front bearing.
 - 6.2. Install the balance shaft driven gear bolt.
 - 6.2.1. Tighten the balance shaft driven gear bolt on the first pass to 20 N.m (15 lb ft).
 - 6.2.2. Tighten the balance shaft driven gear bolt on the final pass using the J 36660-A an additional 35 degrees.



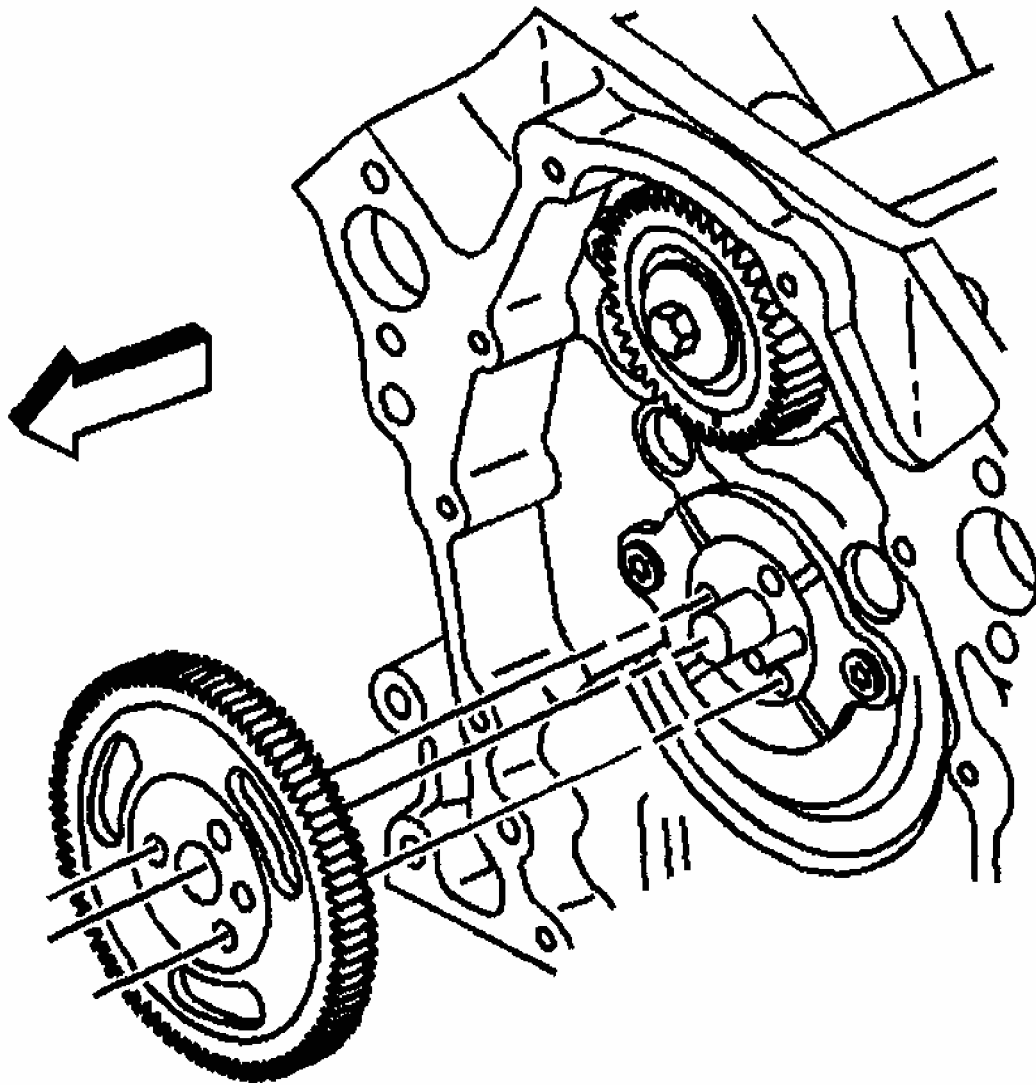
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Fig. 306: Balance Shaft Driven Gear
Courtesy of GENERAL MOTORS CORP.

7. Remove the wrench from the balance shaft.
8. Rotate the balance shaft by hand in order to ensure that there is clearance between the balance shaft and the valve lifter pushrod guide. If the balance shaft does not rotate freely, check to ensure that the retaining ring on the balance shaft front bearing is seated on the case.

Important: DO NOT install the camshaft sprocket bolts at this time.

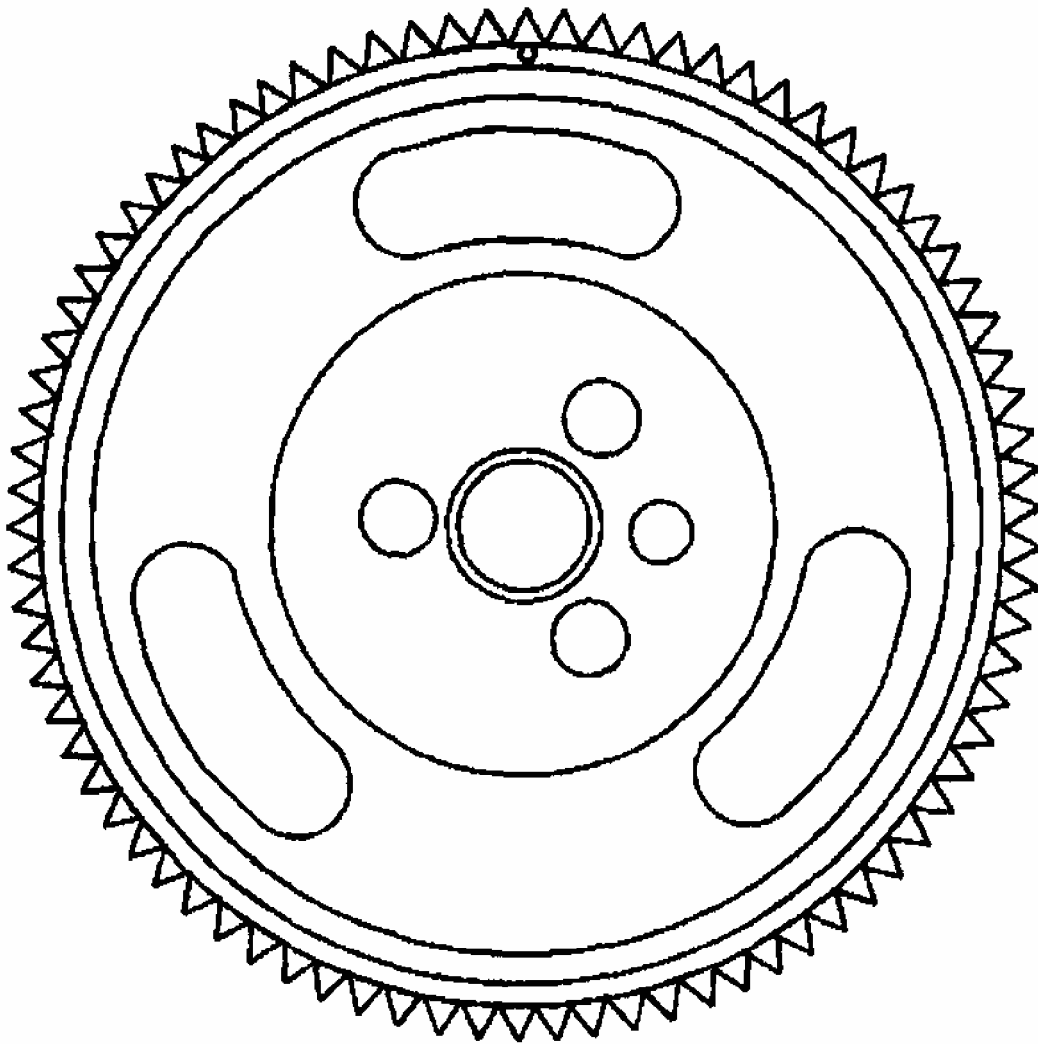
9. Install the balance shaft drive gear.



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Fig. 307: Balance Shaft Drive Gear
Courtesy of GENERAL MOTORS CORP.

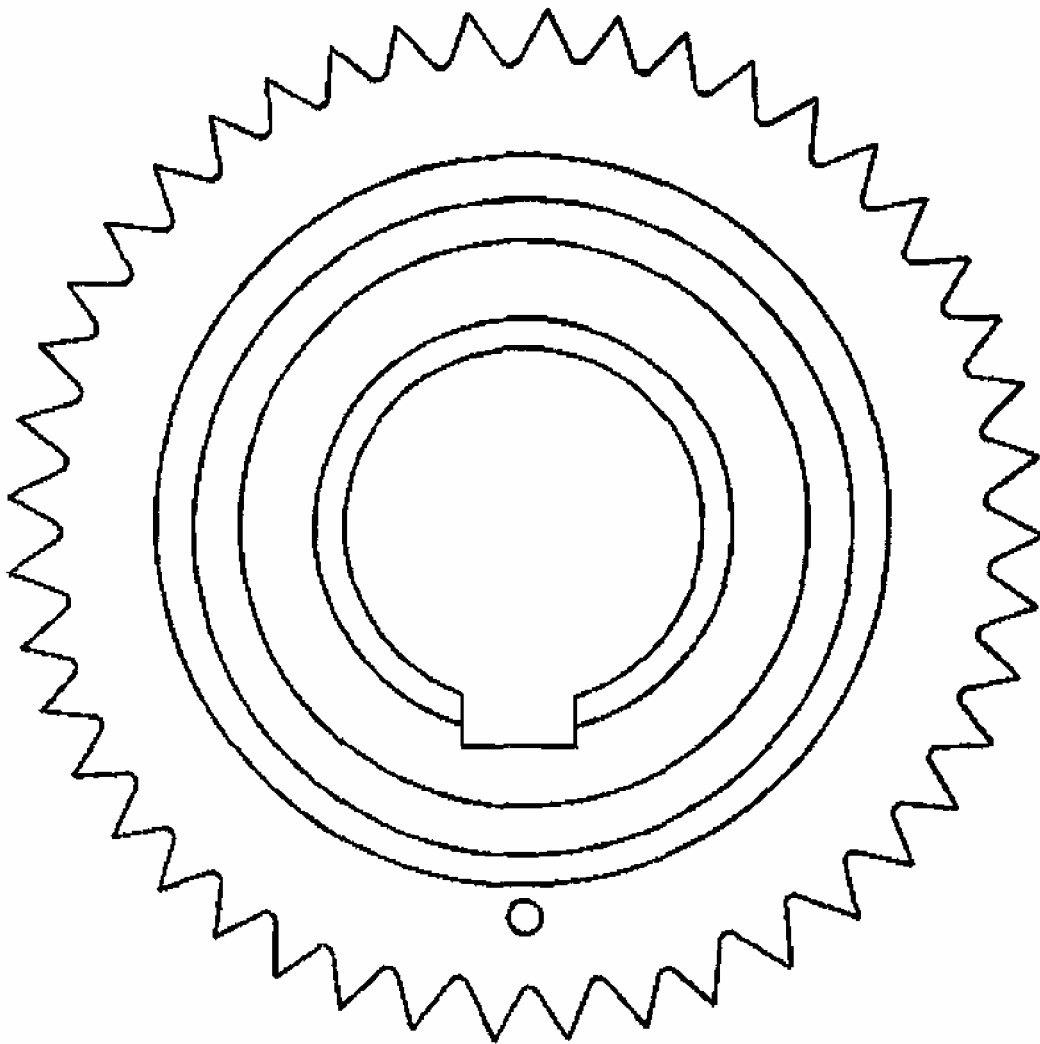
10. Rotate the engine camshaft so that the timing mark on the balance shaft drive gear is in the 12 o'clock position.



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Fig. 308: Balance Shaft Drive Gear Timing Mark
Courtesy of GENERAL MOTORS CORP.

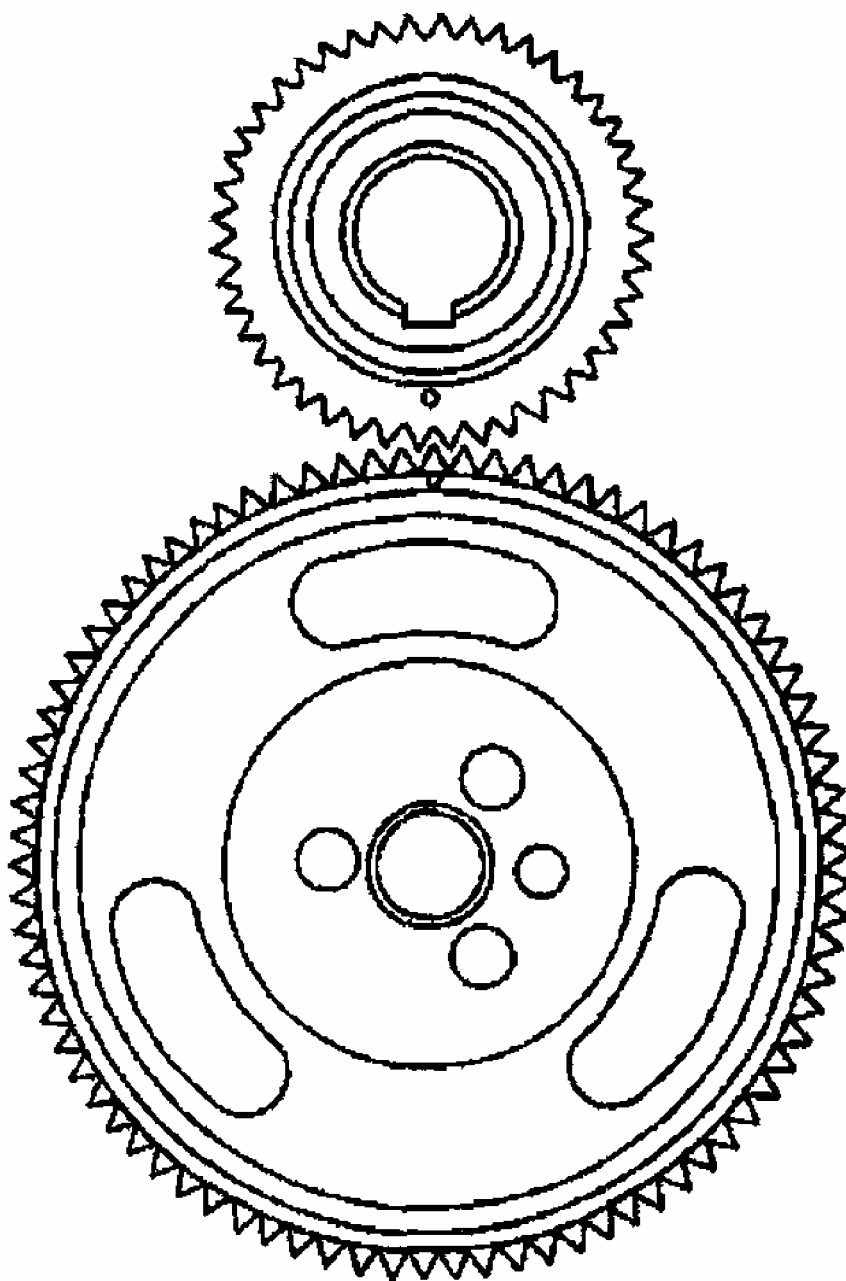
11. Remove the balance shaft drive gear.
12. Rotate the balance shaft so that the timing mark on the balance shaft driven gear is in the 6 o'clock position.



G02503063

Fig. 309: Balance Shaft Driven Gear Timing Mark
Courtesy of GENERAL MOTORS CORP.

13. Position the balance shaft drive gear onto the engine camshaft.
14. Look to ensure that the balance shaft drive gear and the balance shaft driven gear timing marks are aligned.



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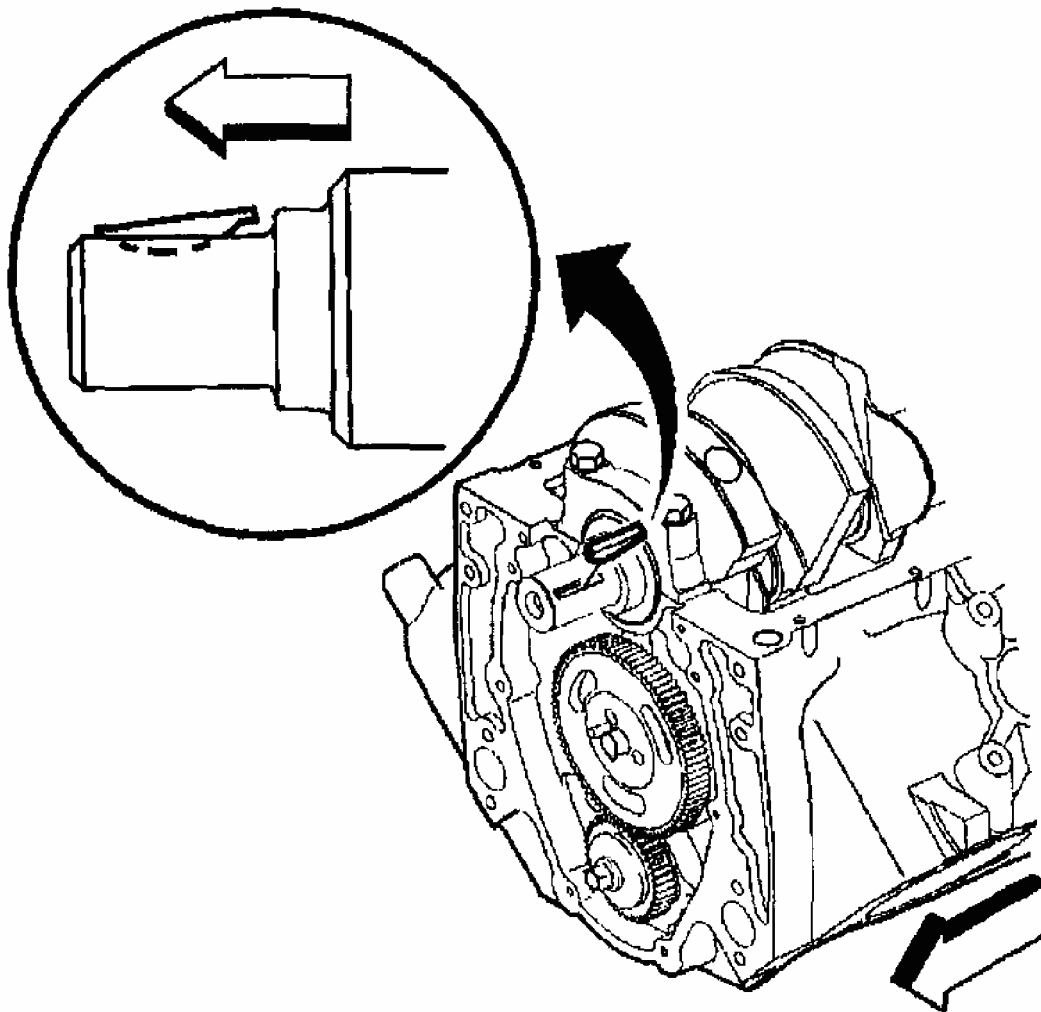
Fig. 310: Aligning Balance Shaft Drive & Driven Gear Timing Marks
Courtesy of GENERAL MOTORS CORP.

TIMING CHAIN & SPROCKETS INSTALLATION

Tools Required

J 5590 Pinion Bearing Race Installer - Rear

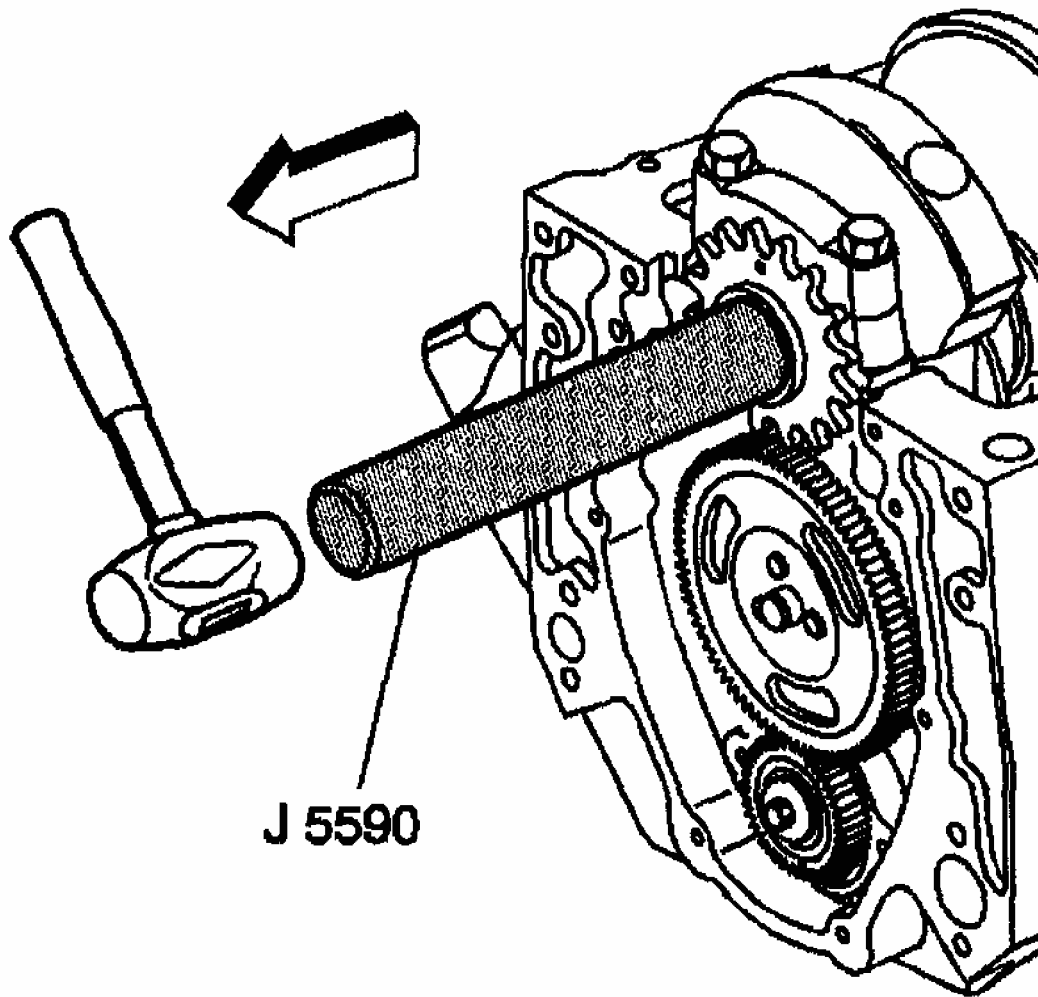
1. Install the crankshaft balancer key into the crankshaft keyway. The crankshaft balancer key should be parallel to the crankshaft or with a slight incline.



G02503065

Fig. 311: Crankshaft Balancer Key
Courtesy of GENERAL MOTORS CORP.

2. Align the keyway of the crankshaft sprocket with the crankshaft balancer key.
3. Use the **J 5590** in order to install the crankshaft sprocket.



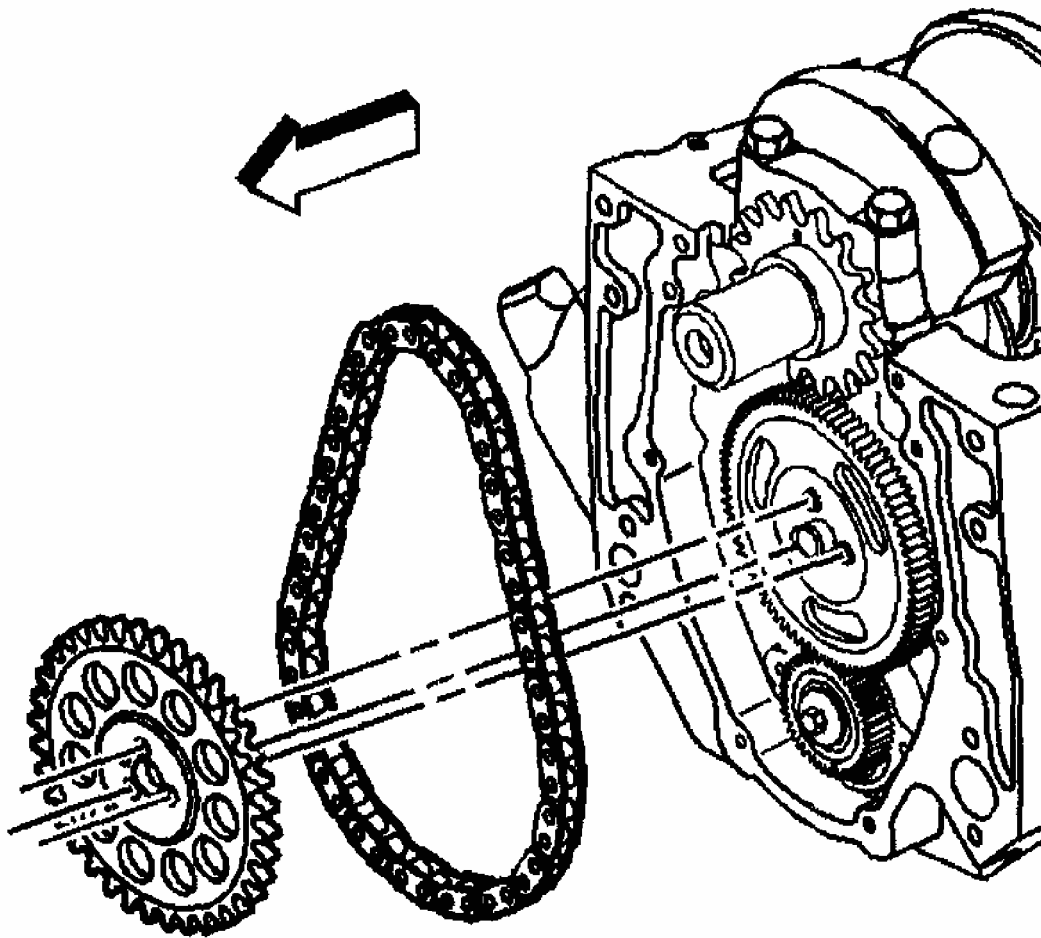
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Fig. 312: Installing Crankshaft Sprocket
Courtesy of GENERAL MOTORS CORP.

4. Rotate the crankshaft until the crankshaft sprocket alignment mark is at the 12 o'clock position.

Important: Install the camshaft sprocket with the alignment mark at the 6 o'clock position.

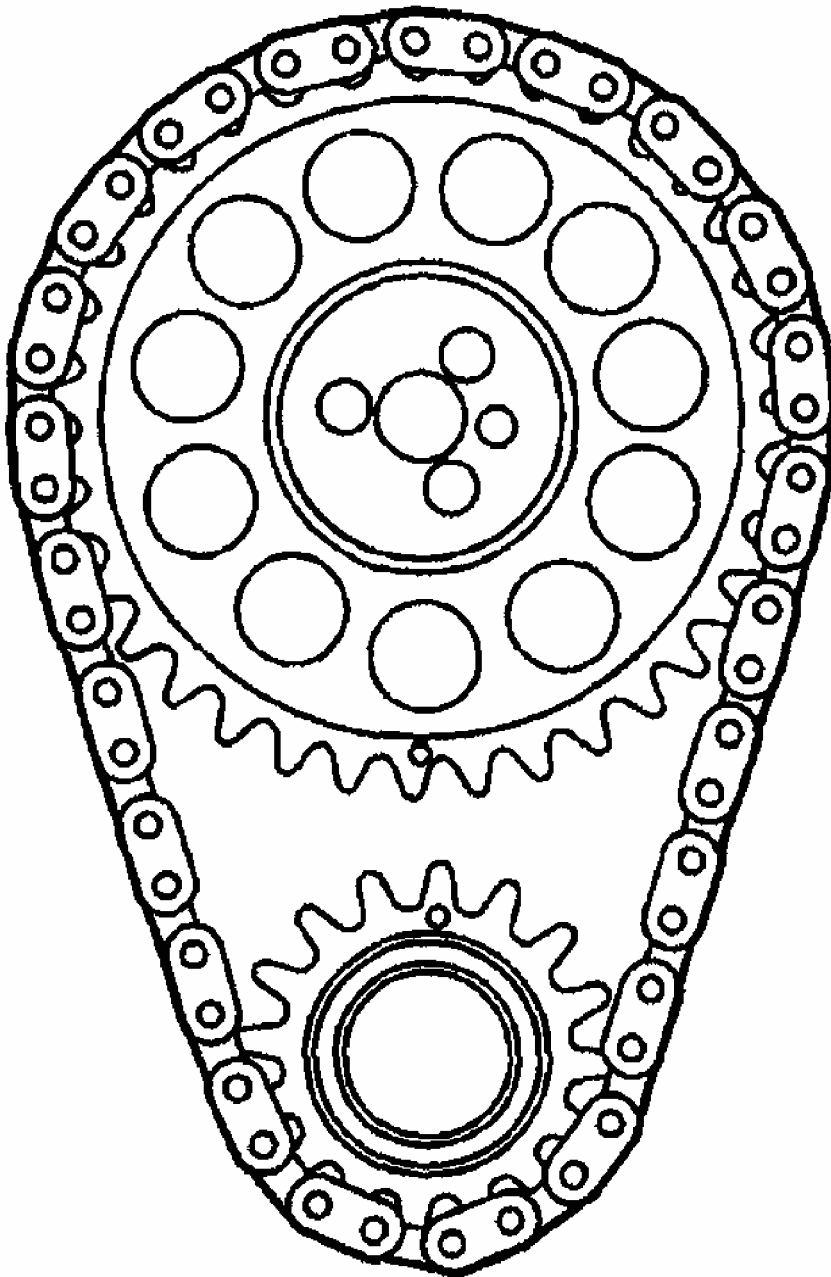
5. Install the camshaft sprocket and the camshaft timing chain.



G02503067

Fig. 313: Installing Camshaft Sprocket & Camshaft Timing Chain
Courtesy of GENERAL MOTORS CORP.

6. Look to ensure that the crankshaft sprocket is aligned at the 12 o'clock position and camshaft sprocket is aligned at the 6 o'clock position.



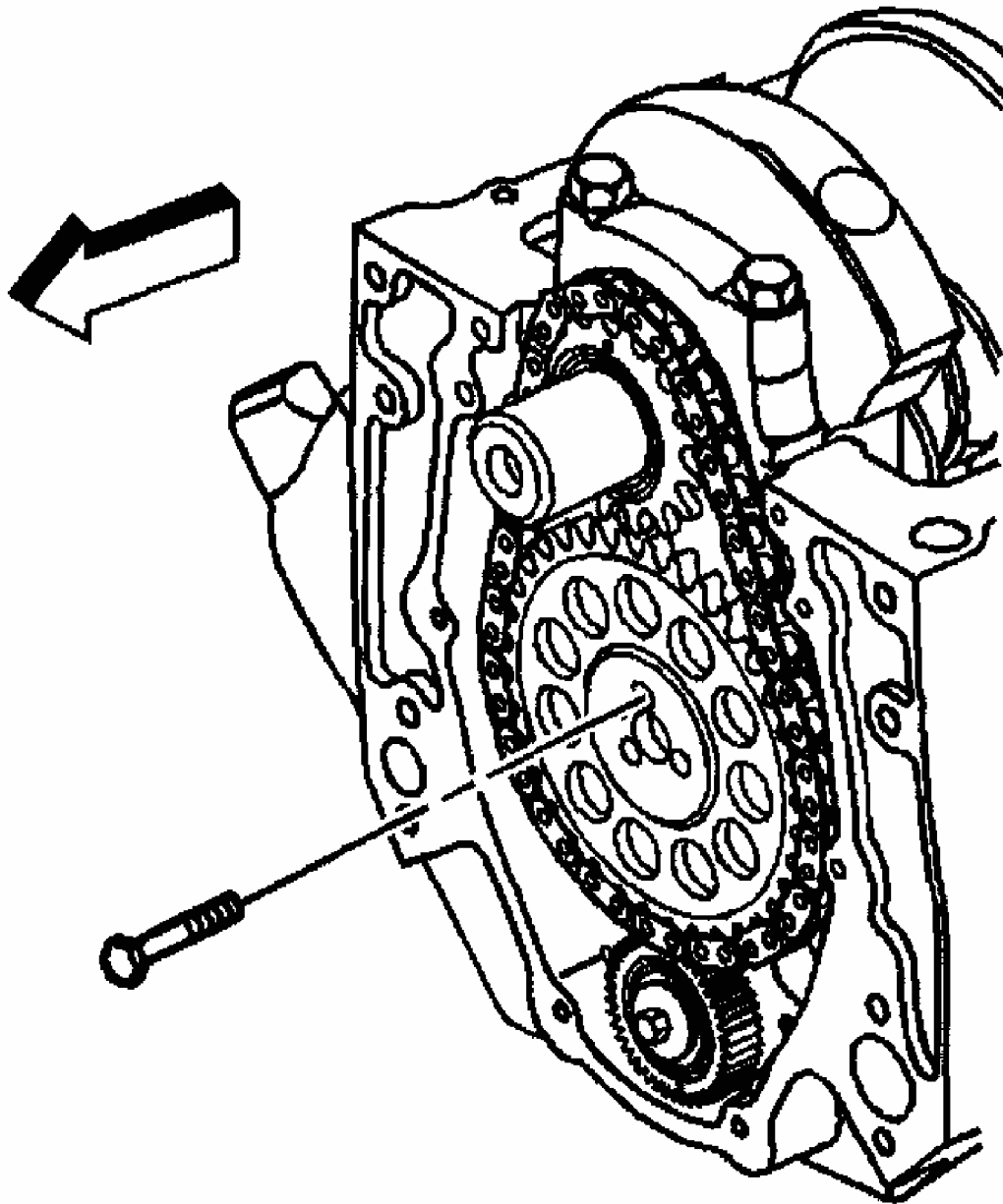
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Fig. 314: Aligning Crankshaft & Camshaft Sprockets
Courtesy of GENERAL MOTORS CORP.

Important: Do not use a hammer to install the camshaft sprocket onto the camshaft. To do so may dislodge the expansion cup plug, camshaft rear bearing hole.

7. Install camshaft sprocket bolts. Tighten the camshaft sprocket bolts to 25 N.m (18 lb

ft).



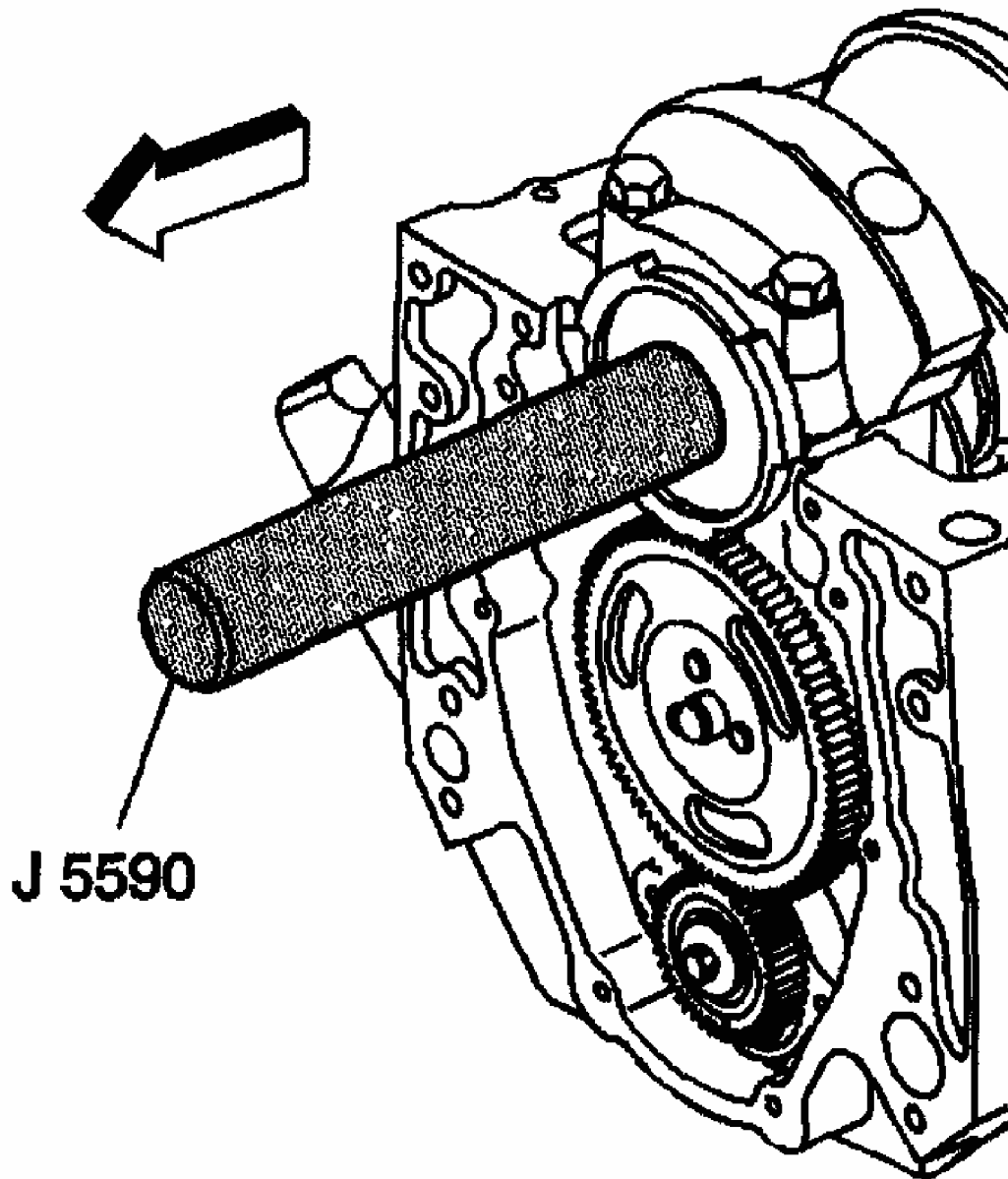
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Fig. 315: Camshaft Sprocket Bolts
Courtesy of GENERAL MOTORS CORP.

8. Install the crankshaft position sensor reluctor ring.
 - 8.1. Align the keyway on the crankshaft position sensor reluctor ring with the

crankshaft balancer key in the crankshaft.

8.2. Use the **J 5590** in order to push the crankshaft position sensor reluctor ring onto the crankshaft until completely seated against the crankshaft sprocket.

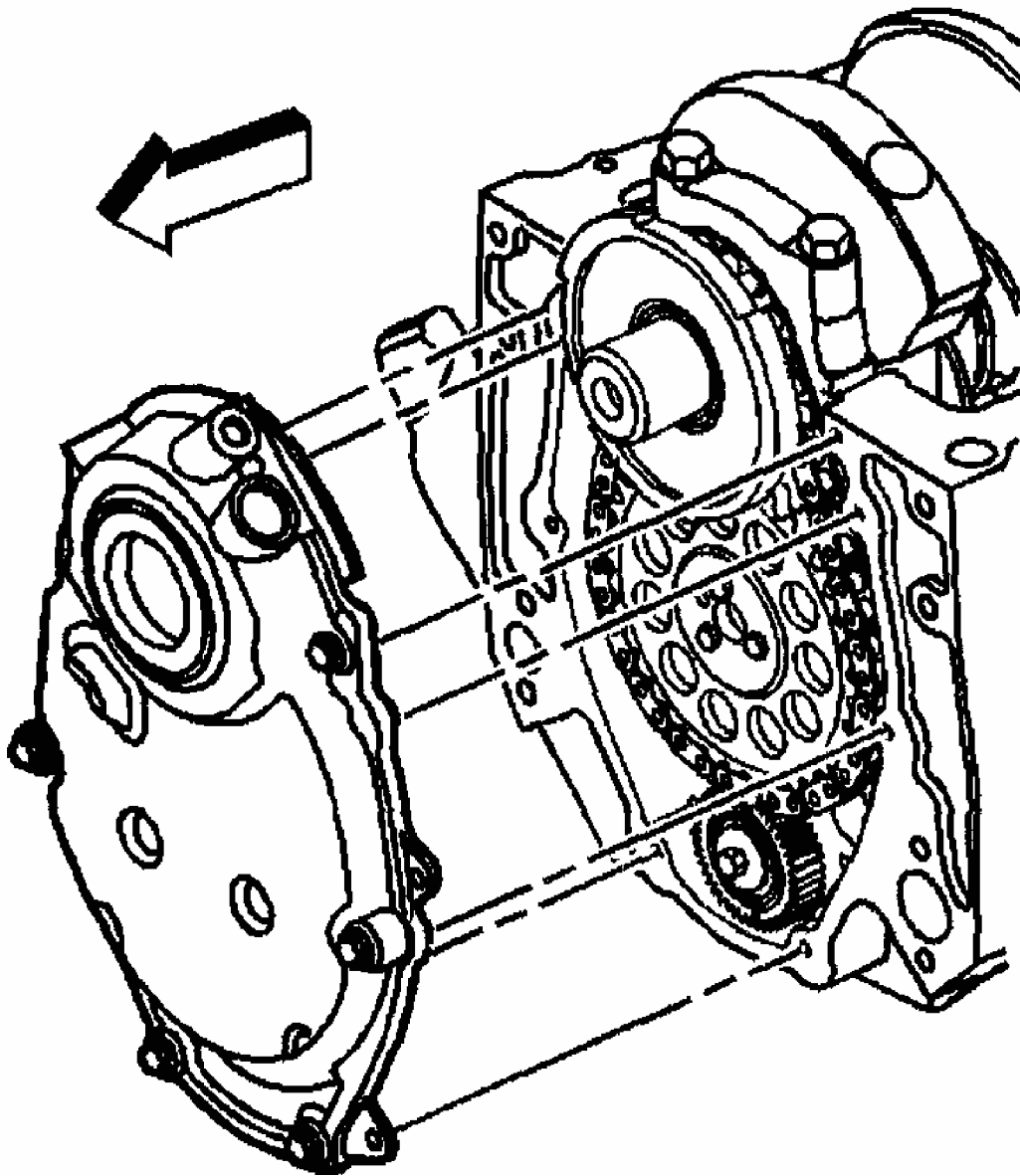


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Fig. 316: Installing Crankshaft Position Sensor Reluctor Ring
Courtesy of GENERAL MOTORS CORP.

Important: Once the composite engine front cover is removed DO NOT reinstall the engine front cover. Always install a NEW engine front cover.

1. Install the NEW engine front cover.
2. Install the engine front cover bolts. Tighten the bolts to 12 N.m (106 lb in).



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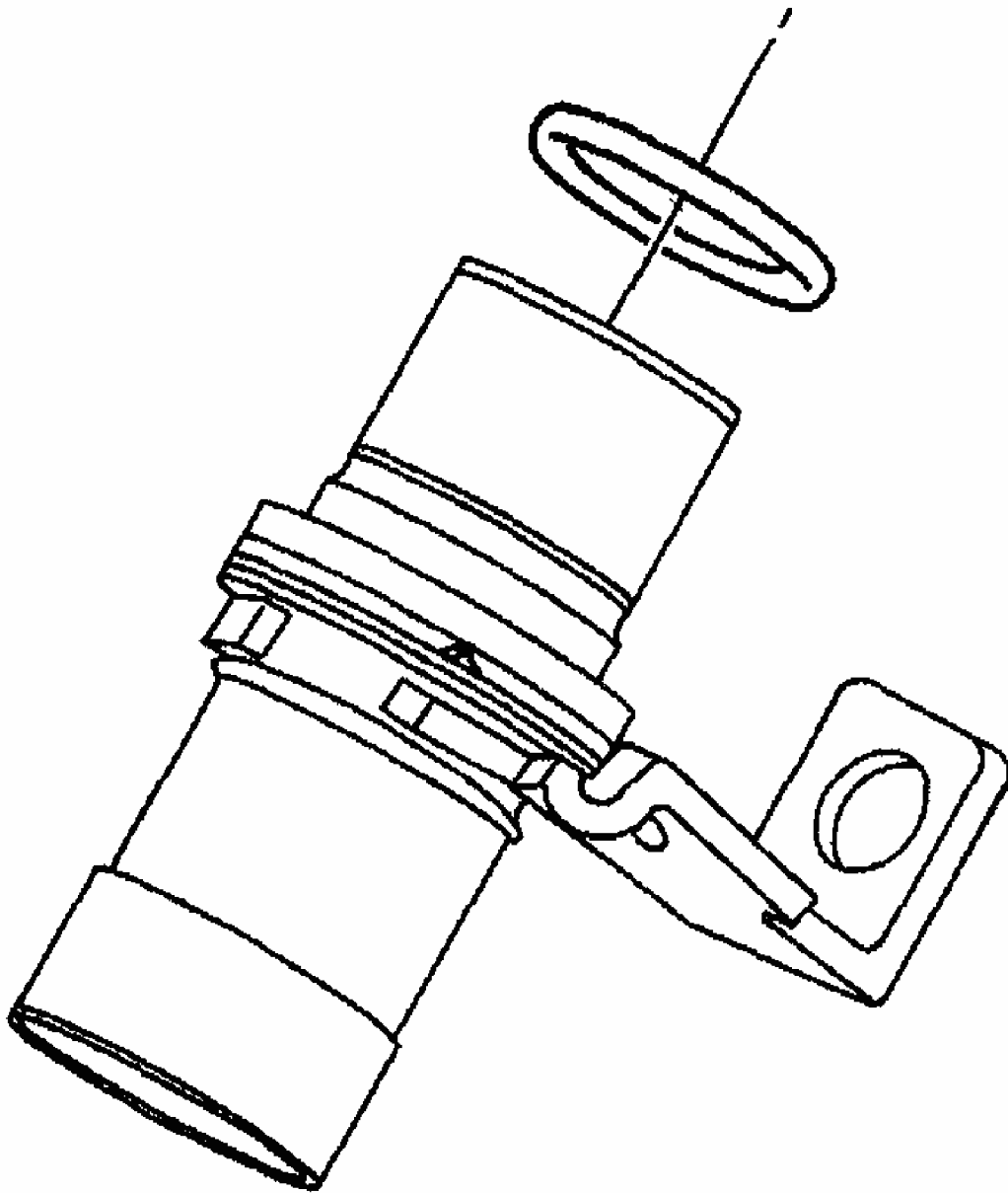
Fig. 317: Engine Front Cover
Courtesy of GENERAL MOTORS CORP.

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

Important: DO NOT reuse the original crankshaft position sensor seal, O-ring. When installing the crankshaft position sensor be sure the crankshaft position sensor is fully seated and held stationary in the engine front cover crankshaft position sensor bore. A crankshaft position sensor that is not completely seated will cock in the engine front cover and may result in erratic engine operation.

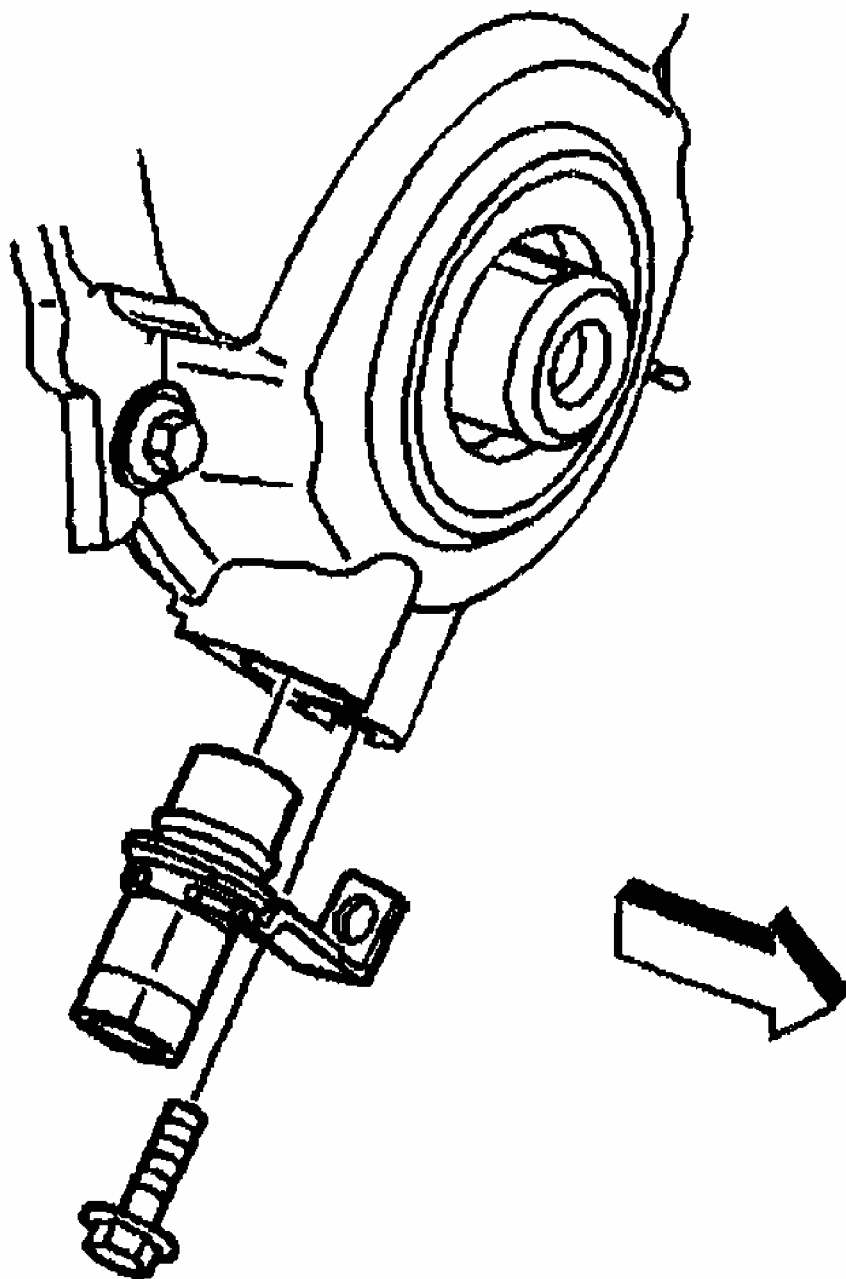
3. Lubricate the NEW crankshaft position sensor seal, O-ring, with clean engine oil.
4. Install the NEW crankshaft position sensor seal, O-ring, onto the crankshaft position sensor.



G02503072

Fig. 318: Crankshaft Position Sensor O-Ring Seal
Courtesy of GENERAL MOTORS CORP.

5. Install crankshaft position sensor until fully seated into the engine front cover.
6. Install crankshaft position sensor bolt. Tighten the crankshaft position sensor bolt to 8 N.m (71 lb in).

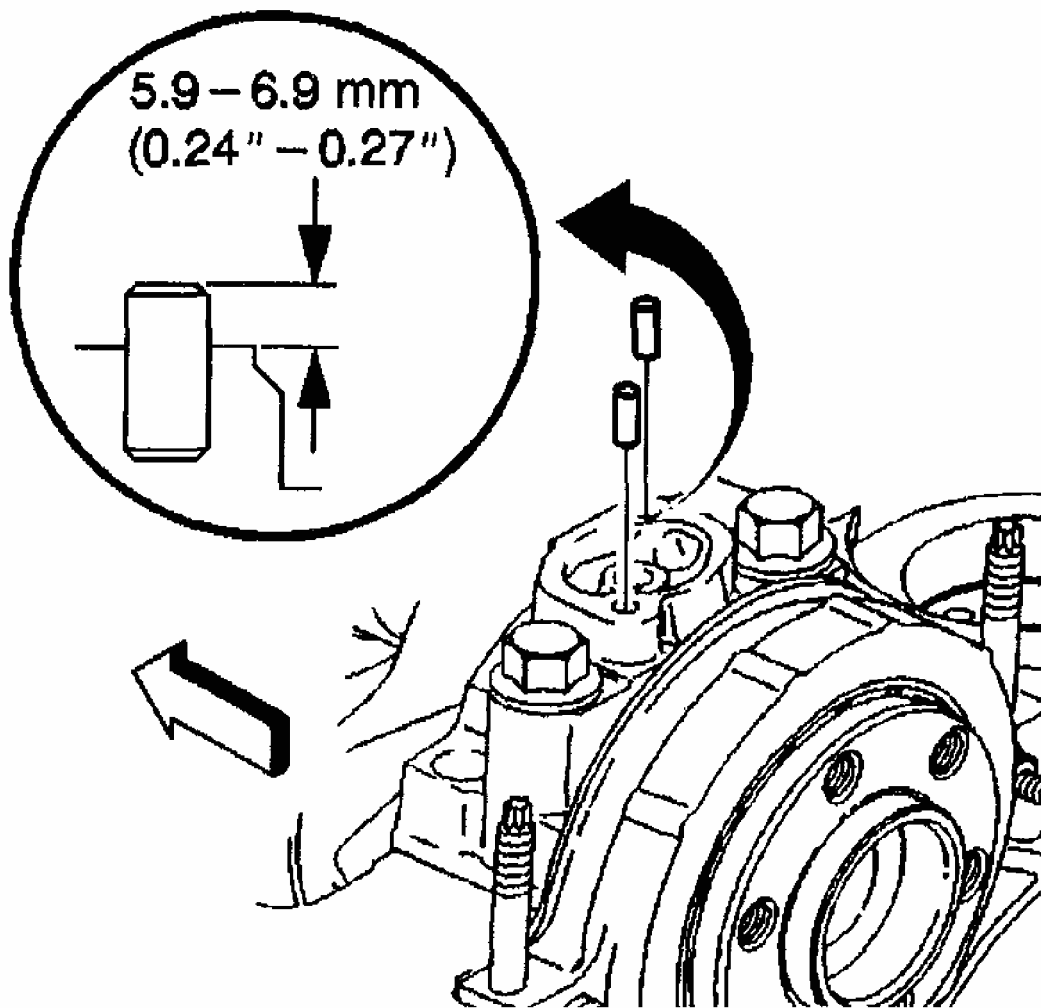


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Fig. 319: Crankshaft Position Sensor Bolt
Courtesy of GENERAL MOTORS CORP.

OIL PUMP INSTALLATION

1. Inspect for properly installed oil pump locator pins.



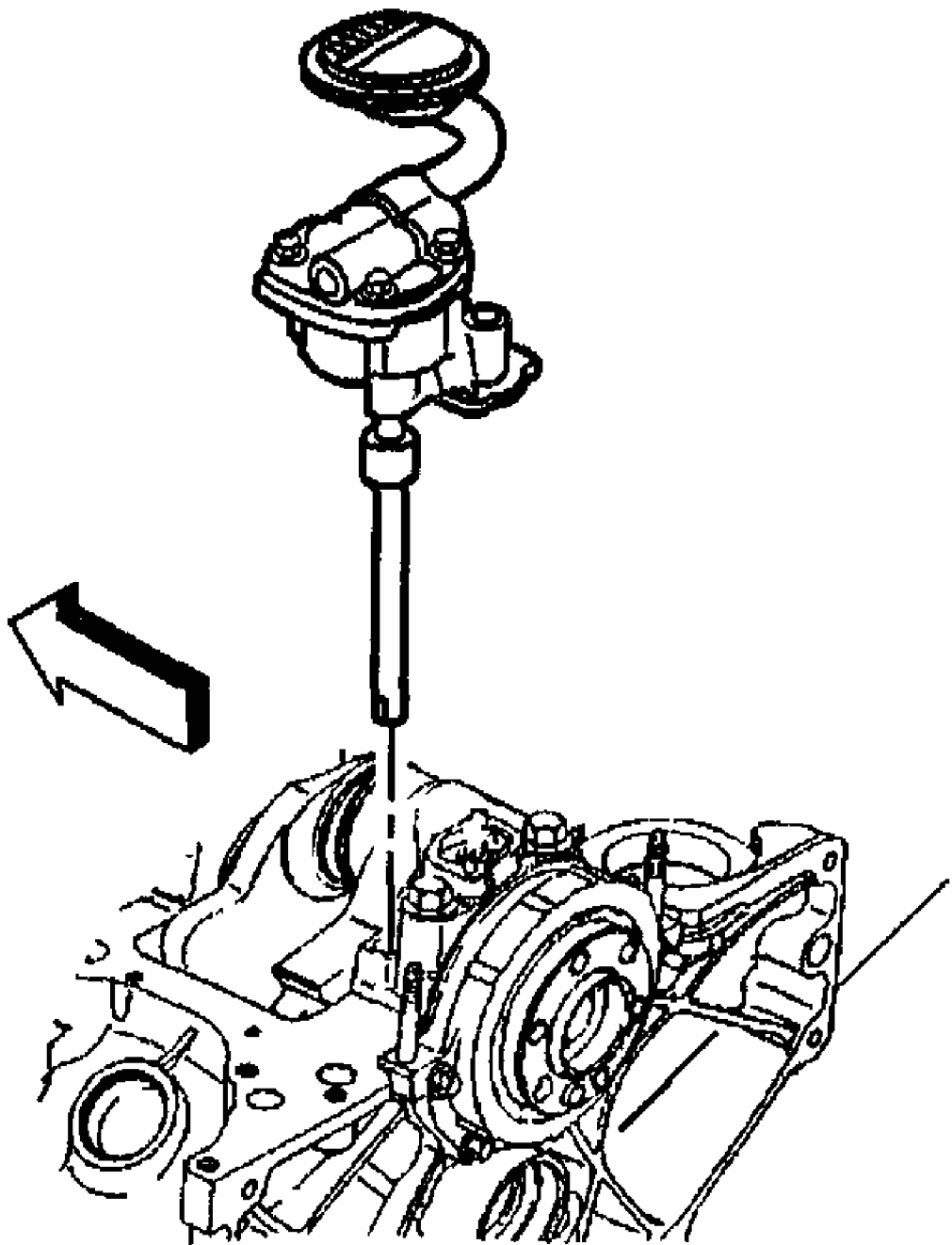
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Fig. 320: Oil Pump Locator Pins
Courtesy of GENERAL MOTORS CORP.

Important: Do not reuse the oil pump driveshaft retainer.

During assembly, install a NEW oil pump driveshaft retainer.

2. Install the oil pump.
3. Position the oil pump onto the pins.



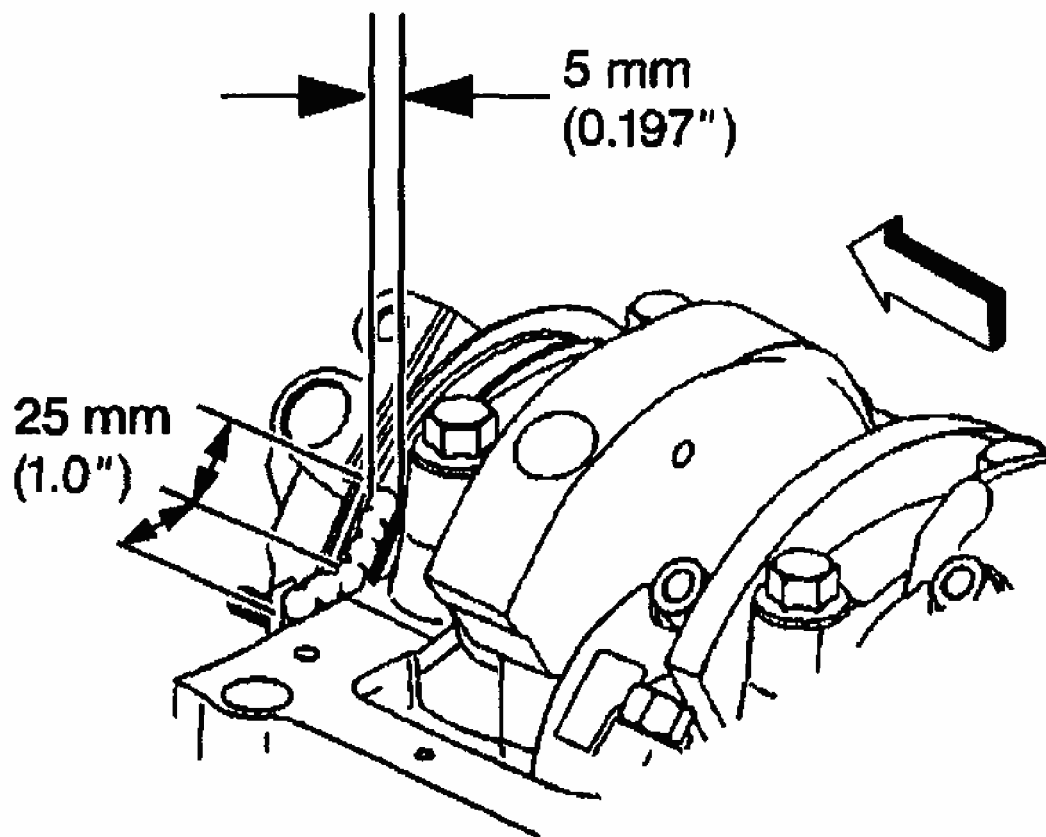
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Fig. 321: Positioning Oil Pump Onto Pins
Courtesy of GENERAL MOTORS CORP.

4. Install the oil pump bolt attaching the oil pump to the rear crankshaft bearing cap. Tighten the oil pump bolt to 90 N.m (66 Lb ft).

OIL PAN INSTALLATION

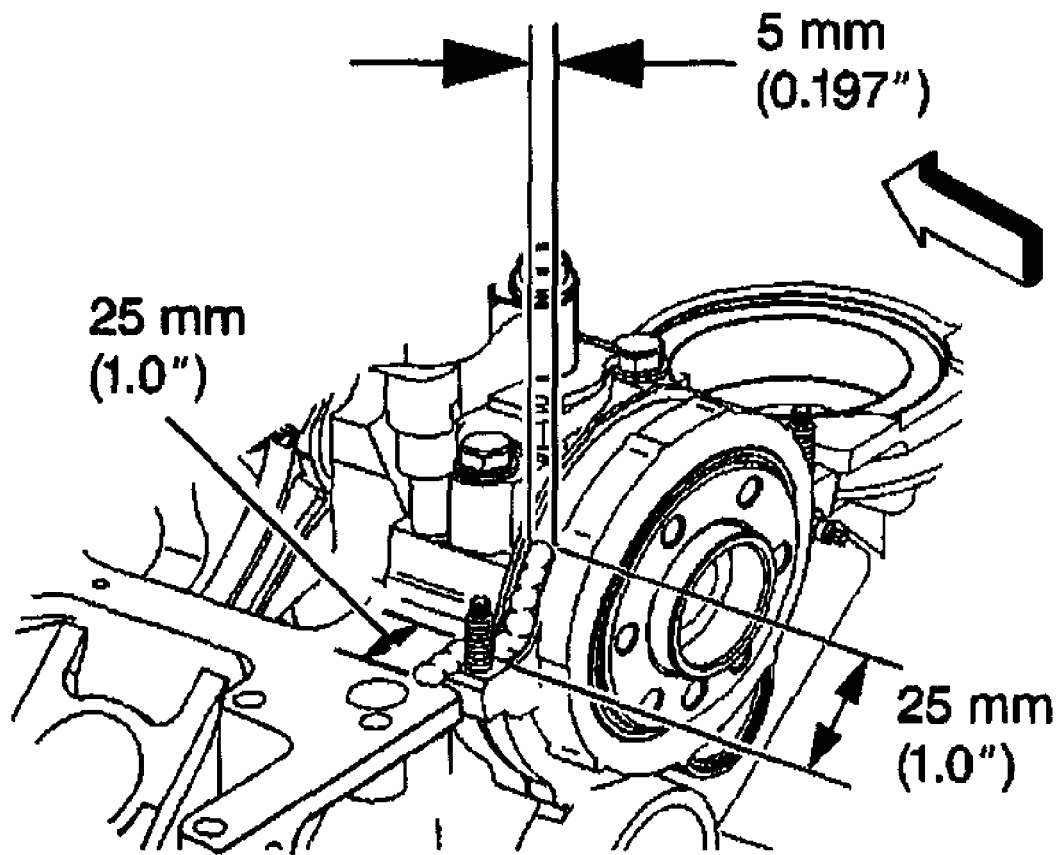
1. Apply a 5 mm (0.197 in) wide and 25 mm (1.0 in) long bead of adhesive GM P/N United States 12346141, GM P/N Canada 10953433, or equivalent, to both the right and left sides of the engine front cover to engine block junction at the oil pan sealing surfaces.



G02503077

Fig. 322: Applying Adhesive To Both Right & Left Sides Of Engine Front Cover To Engine Block Junction At Oil Pan Sealing Surfaces
Courtesy of GENERAL MOTORS CORP.

2. Apply a 5 mm (0.197 in) wide and 25 mm (1.0 in) long bead of adhesive GM P/N United States 12346141, GM P/N Canada 10953433, or equivalent, to both the right and left sides of the crankshaft rear oil seal housing to engine block junction at the oil pan sealing surfaces.



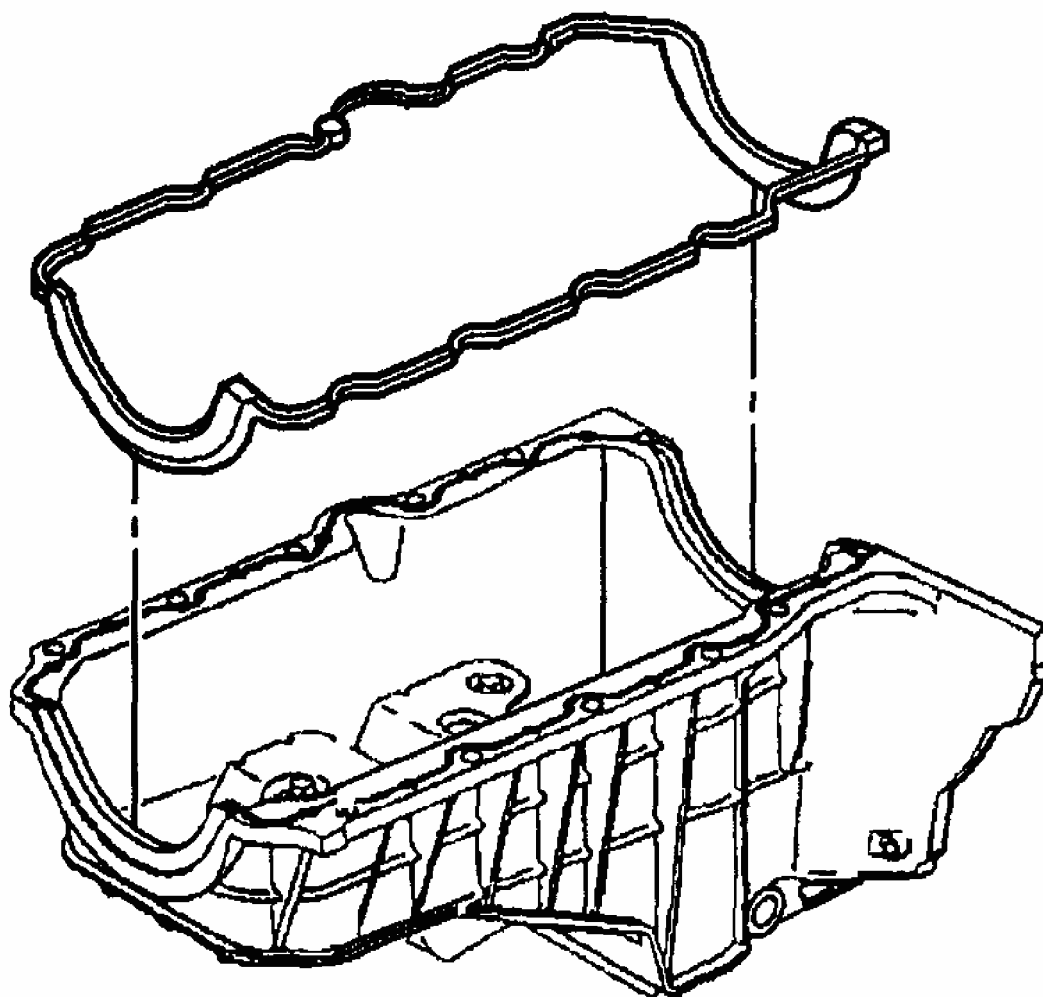
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Fig. 323: Applying Adhesive To Both The Right & Left Sides Of Crankshaft Rear Oil Seal Housing To Engine Block Junction At Oil Pan Sealing Surfaces
Courtesy of GENERAL MOTORS CORP.

Important: Always install a NEW oil pan gasket.

The oil pan gasket and oil pan must be installed and the fasteners tightened while the adhesive is still wet to the touch.

3. Install the NEW oil pan gasket into the groove in the oil pan.



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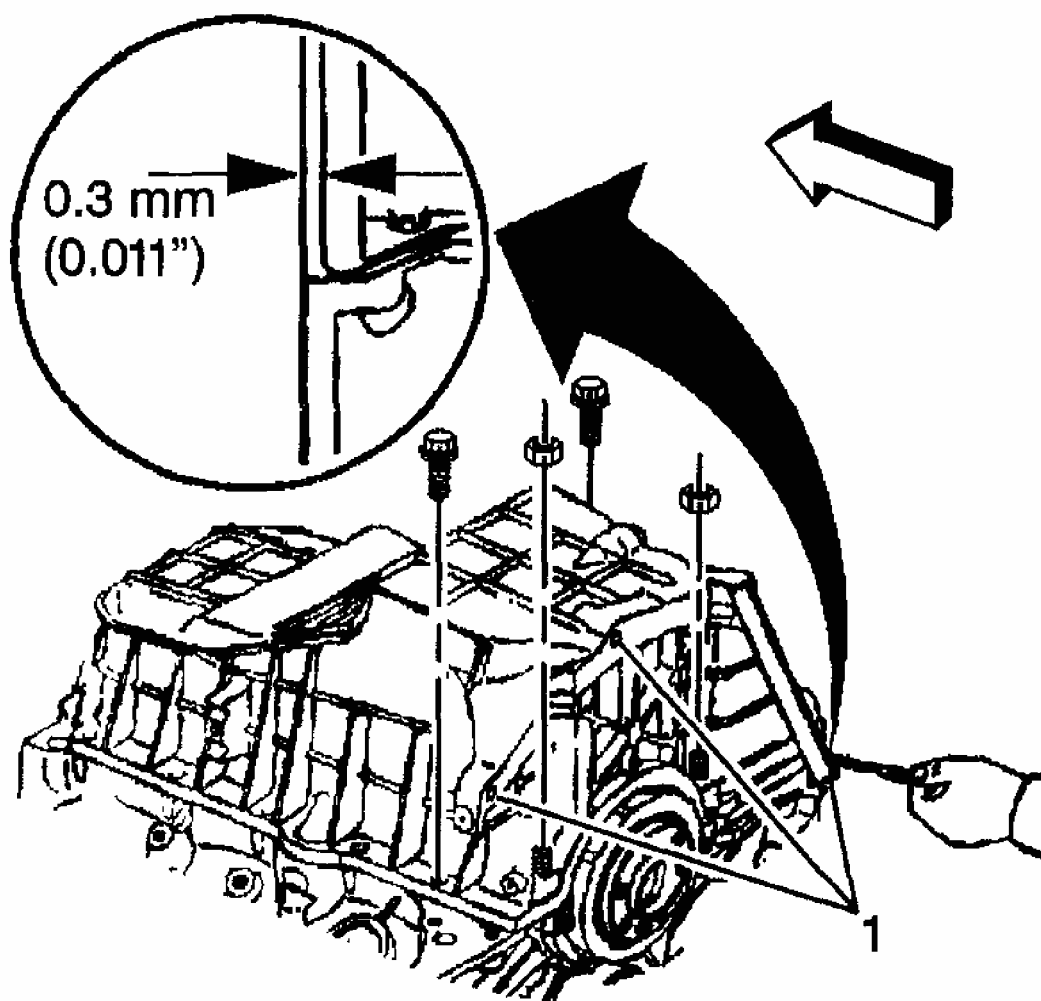
Fig. 324: Oil Pan Gasket

Courtesy of GENERAL MOTORS CORP.

Important: The oil pan alignment must always be flush or forward no more than 0.3 mm (0.011 in) from the rear face of the engine block.

4. Install the oil pan onto the engine block. Press the oil pan gasket into the grooves of the engine front cover and crankshaft rear oil seal housing.
5. Slide the oil pan back against a suitable straight edge.
6. Install the oil pan bolts and nuts, but do not tighten.
7. Measure the pan-to-transmission housing clearance using a feeler gage and a straight edge. Use a feeler gage to check the clearance between the oil pan-to-transmission housing measurement points. If the clearance exceeds 0.3 mm (0.011 in) at any of the 3 oil pan-to-transmission housing measurement points (1), then repeat the step until the

oil pan-to-transmission housing clearance is within the specification. The oil pan must always be forward of the rear face of the engine block.



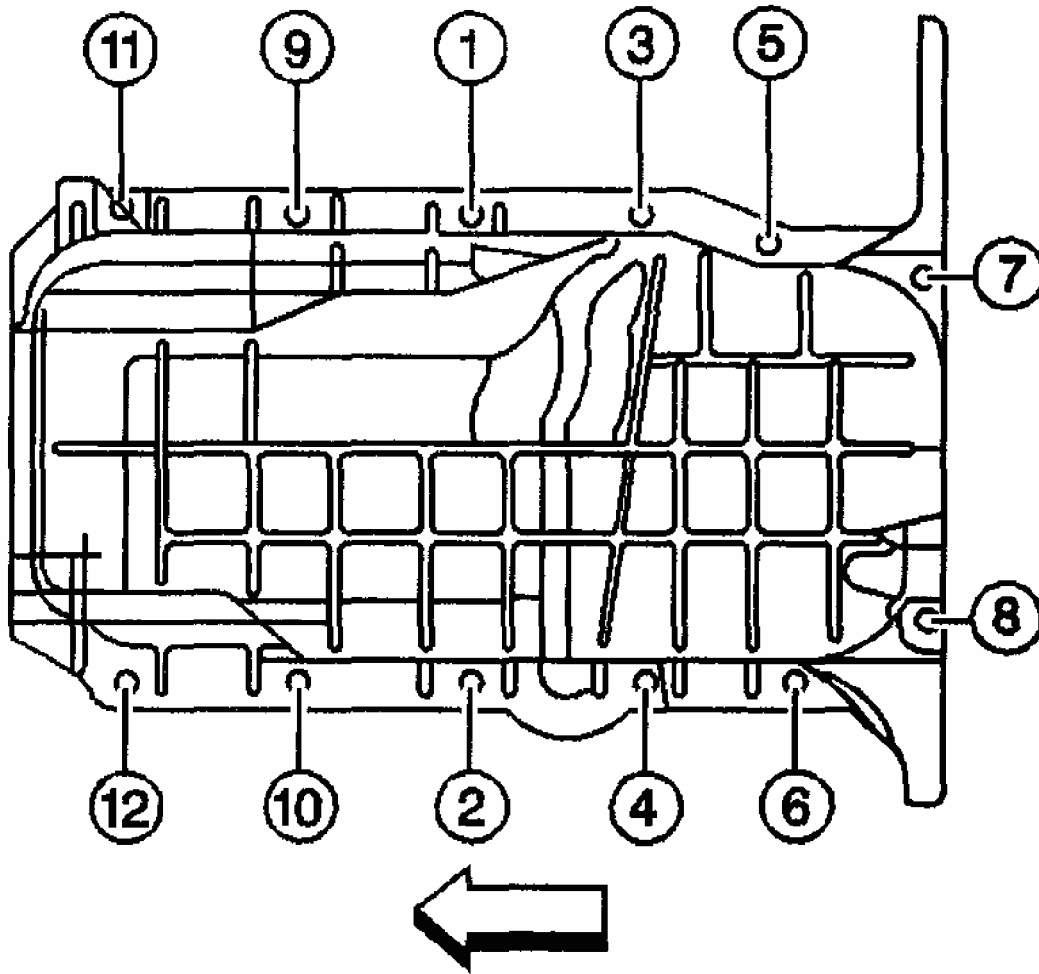
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Fig. 325: Measuring Pan-To-Transmission Housing Clearance Using A Feeler Gage & Straight Edge
Courtesy of GENERAL MOTORS CORP.

NOTE: The alignment of the mating components is crucial. An offset greater than 0.30 mm (0.011 in) between the rear faces of the oil pan and block is not acceptable. Offsets greater than 0.30 mm (0.011 in) will affect the alignment between the engine assembly and the transmission. Mis-alignment of the engine assembly to the transmission can lead to internal and external damage to the engine assembly and/or

transmission.

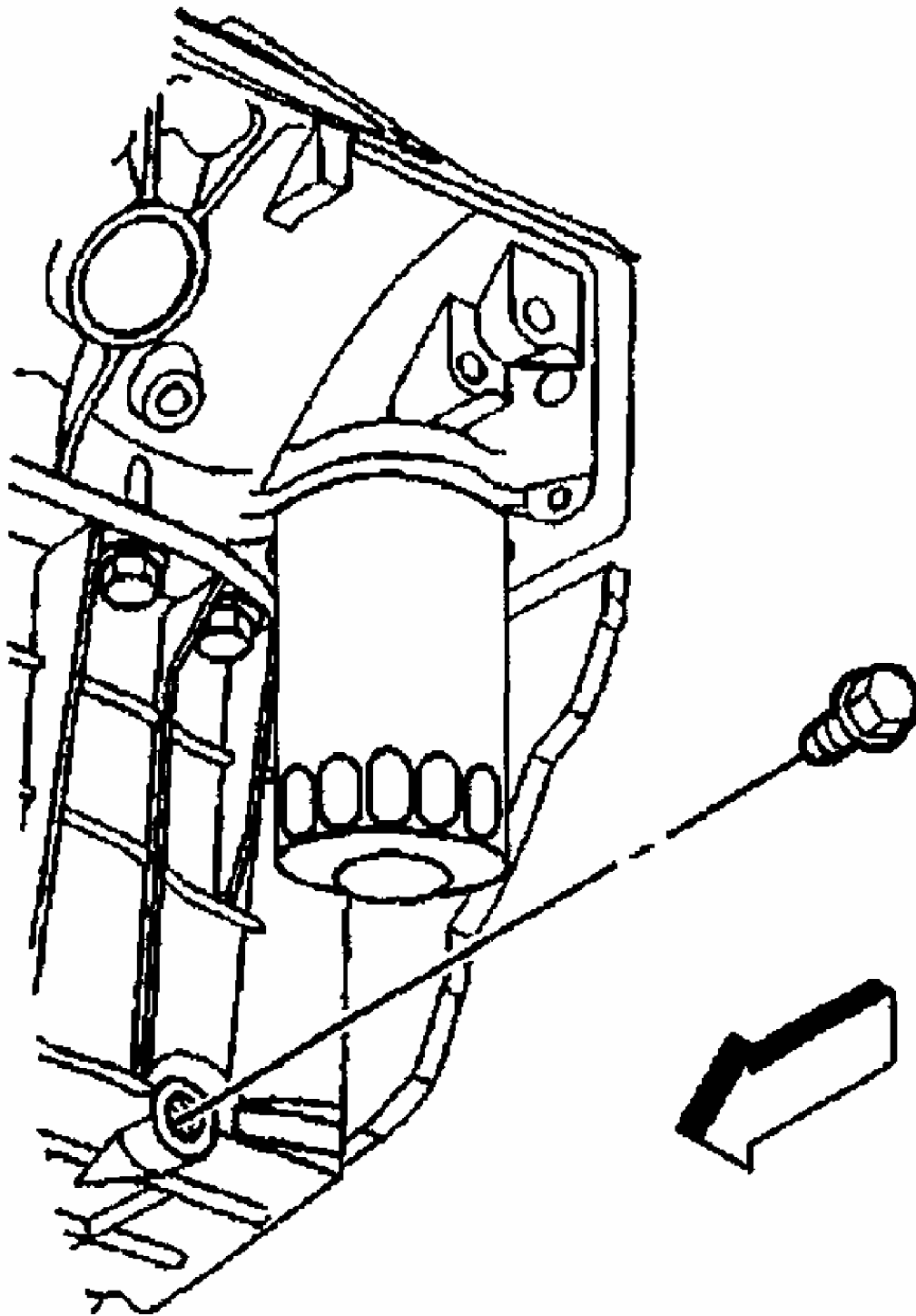
8. Tighten the oil pan bolts and nuts in sequence (1-12). Tighten the oil pan bolts to 25 N.m (18 Lb ft).



G02503082

Fig. 326: Oil Pan Bolts & Nuts Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

9. Measure the clearance between the 3 oil pan-to-transmission housing measurement points in order to ensure proper alignment.
10. Install a NEW oil pan drain plug seal, O-ring, onto the oil pan drain plug.
11. Install the oil pan drain plug into the oil pan. Tighten the oil pan drain plug to 25 N.m (18 Lb ft).

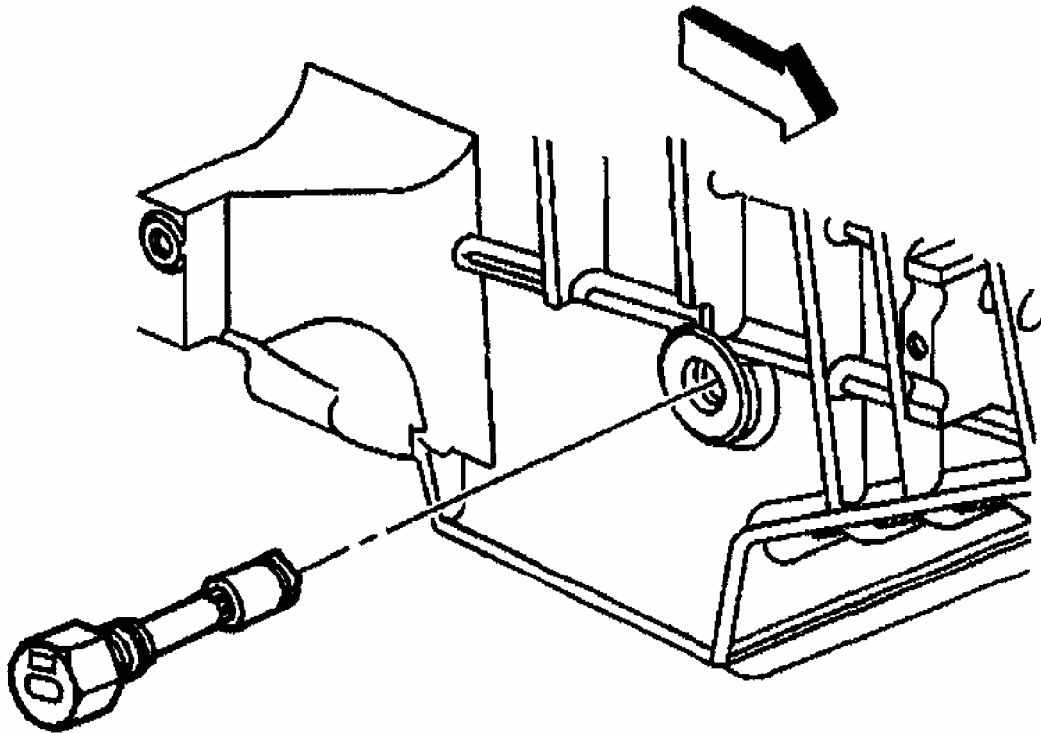


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Fig. 327: Oil Pan Drain Plug

Courtesy of GENERAL MOTORS CORP.

12. Install the NEW engine oil level sensor, if applicable. Tighten the engine oil level sensor to 13 N.m (115 lb in).

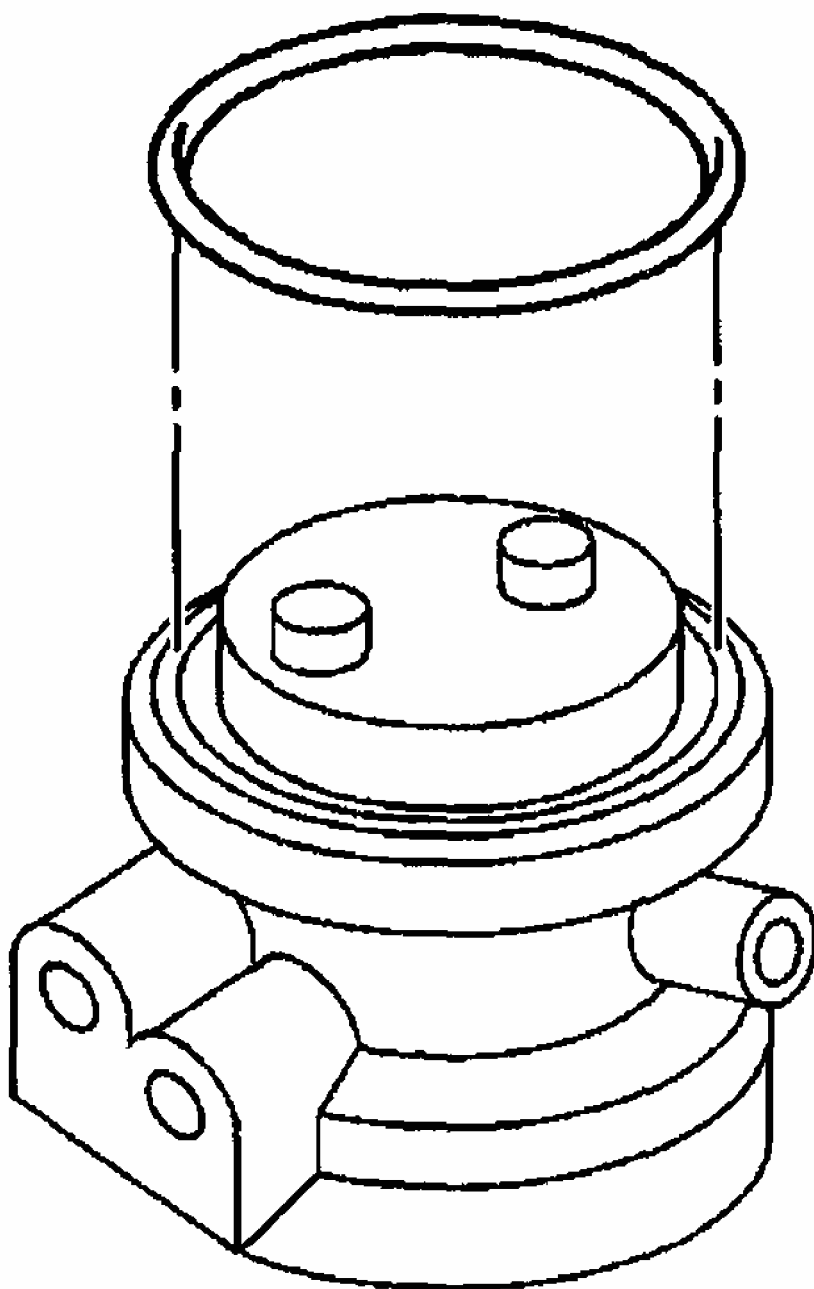


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Fig. 328: Engine Oil Level Sensor
Courtesy of GENERAL MOTORS CORP.

OIL FILTER ADAPTER INSTALLATION

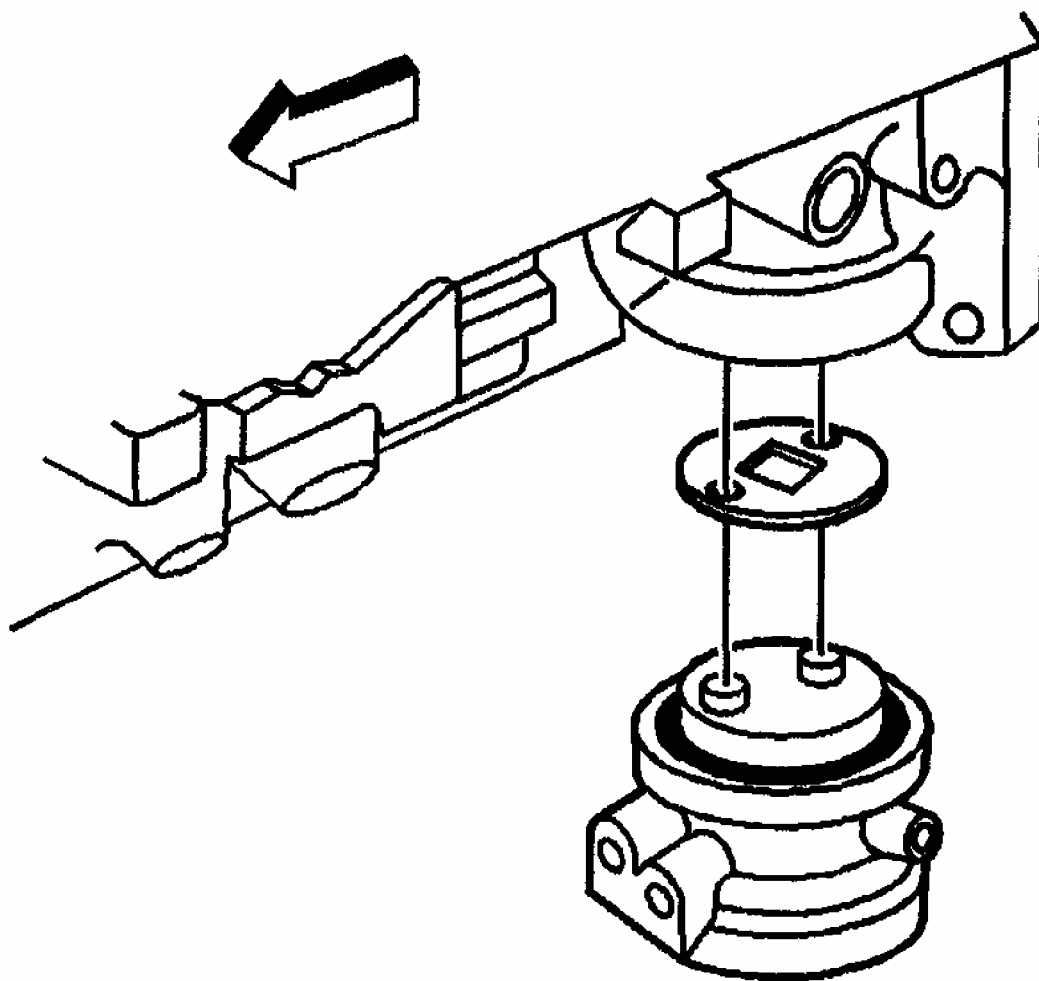
1. Install the NEW oil filter adapter seal, O-ring, into the groove in the oil filter adapter.



G02503085

Fig. 329: Oil Filter Adapter O-Ring Seal
Courtesy of GENERAL MOTORS CORP.

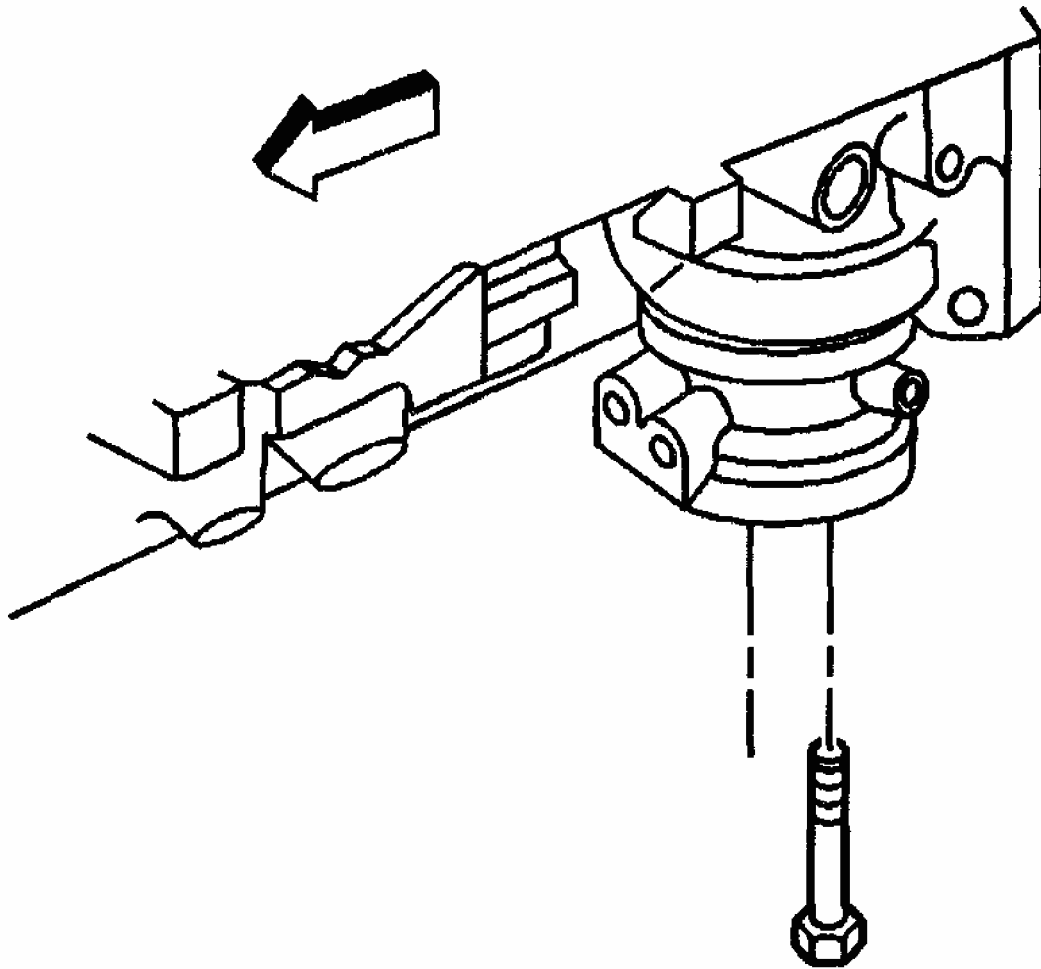
2. Install the oil filter adapter and NEW oil filter adapter gasket.



G02503086

Fig. 330: Oil Filter Adapter & Gasket
Courtesy of GENERAL MOTORS CORP.

3. Install the oil filter adapter bolts. Tighten the oil filter adapter bolts to 21 N.m (15 lb ft).



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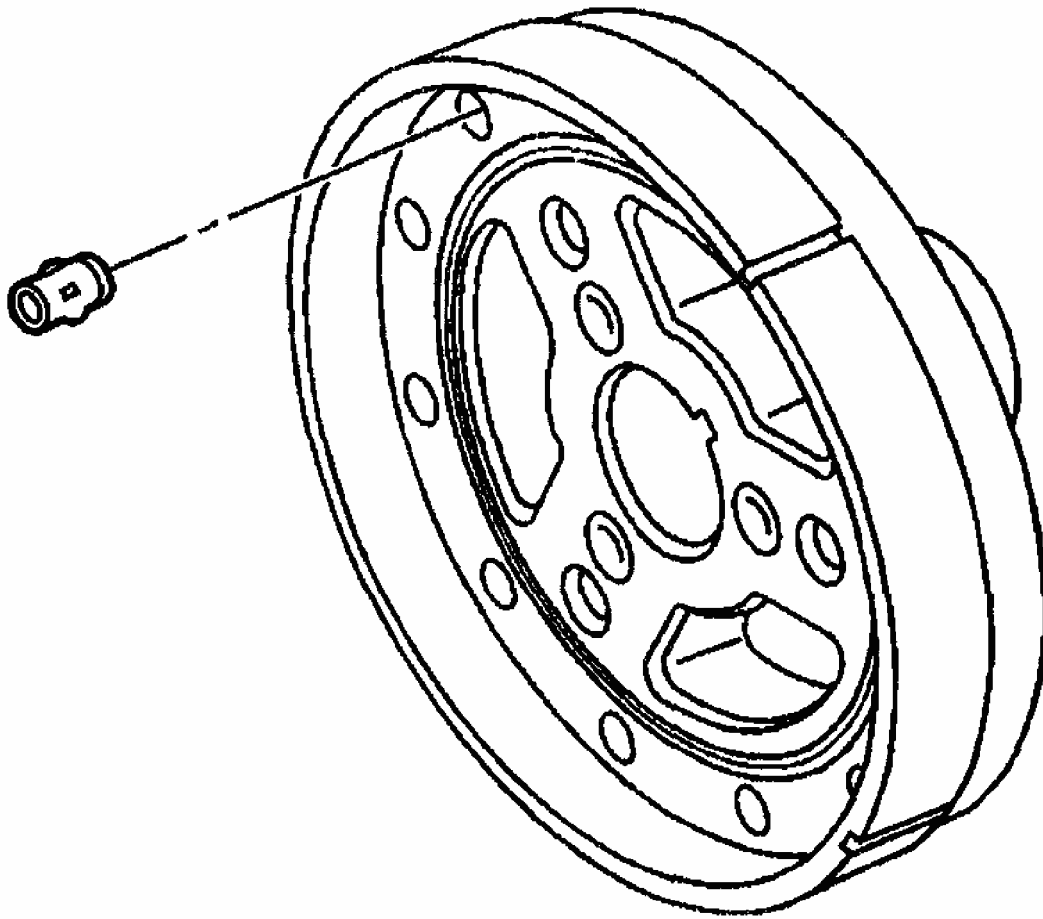
Fig. 331: Oil Filter Adapter Bolt
Courtesy of GENERAL MOTORS CORP.

CRANKSHAFT BALANCER INSTALLATION

Tools Required

J 23523-F Balancer Remover and Installer

1. Look to ensure that the crankshaft balancer front groove pin is installed in the proper location, if applicable. The length and location of the pins must be the same as the original length and location.

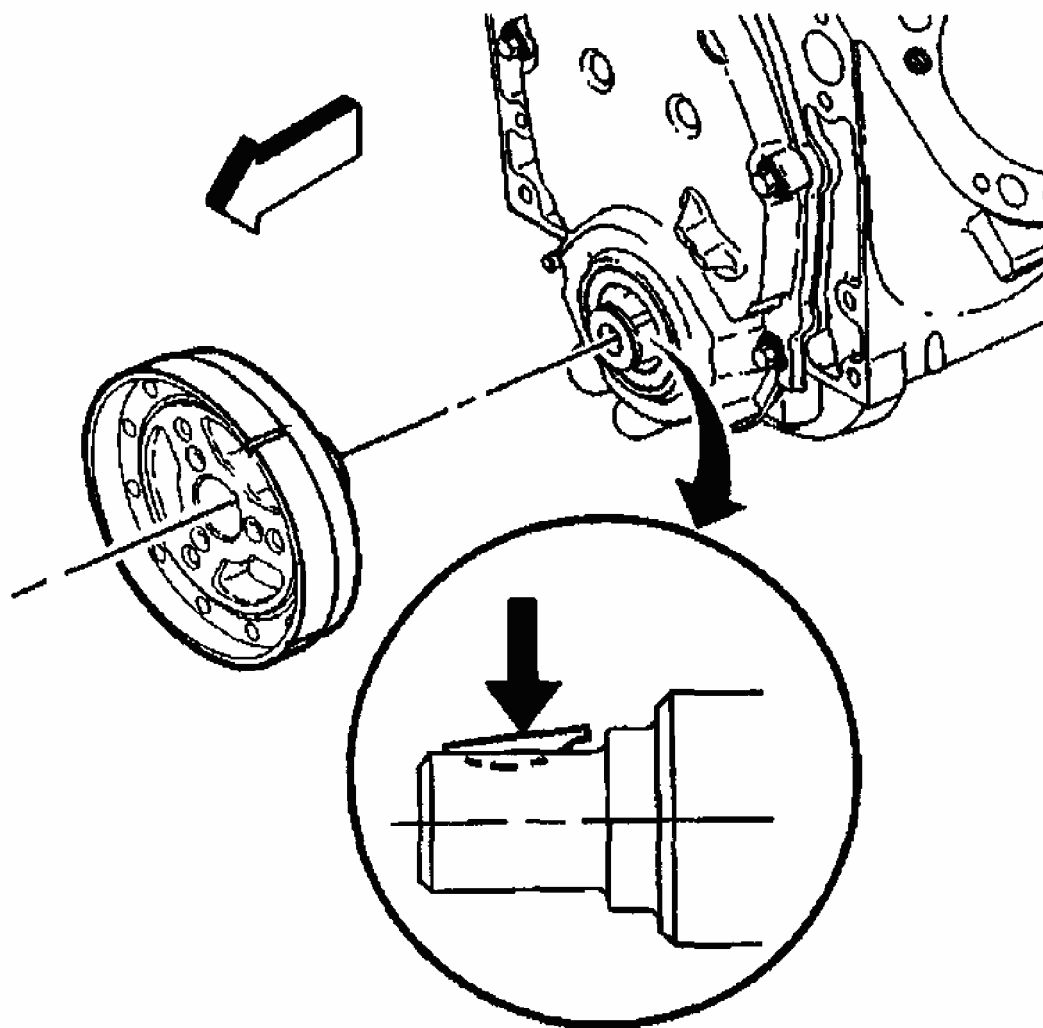


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Fig. 332: Crankshaft Balancer Front Groove Pin
Courtesy of GENERAL MOTORS CORP.

NOTE: The inertial weight section of the crankshaft balancer is assembled to the hub with a rubber type material. The correct installation procedures (with the proper tool) must be followed or movement of the inertial weight section of the hub will destroy the tuning of the crankshaft balancer.

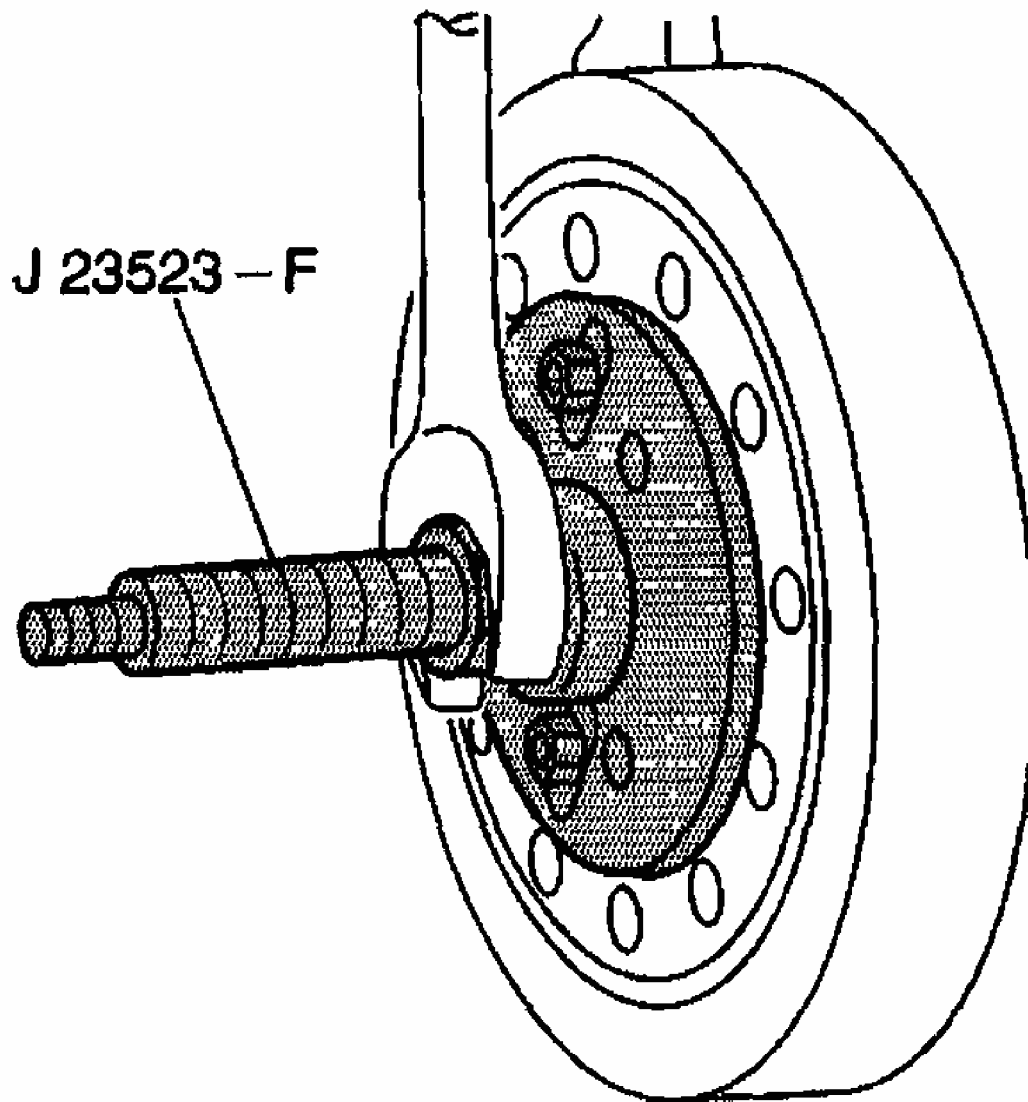
2. Apply a small amount of adhesive GM P/N United States 12346141, GM P/N Canada 10953433, or equivalent, onto the crankshaft balancer keyway in order to seal the crankshaft balancer keyway and crankshaft joint.
3. Align the keyway of the crankshaft balancer with the crankshaft balancer key.
4. Install the crankshaft balancer onto the end of the crankshaft.



G02503089

Fig. 333: Crankshaft Balancer Key
Courtesy of GENERAL MOTORS CORP.

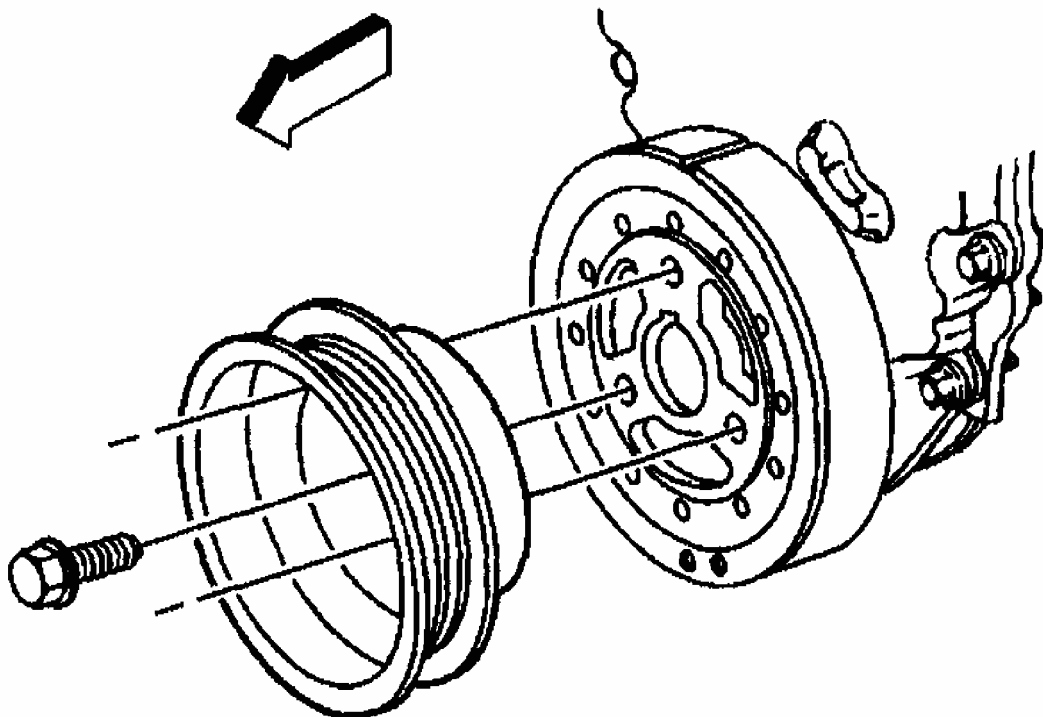
5. Use the **J 23523-F** in order to press the crankshaft balancer onto the crankshaft.
 - 5.1. Install the **J 23523-F** plate and bolts onto the front of the crankshaft balancer. Tighten the **J 23523-F** plate bolts to 25 N.m (18 lb ft).
 - 5.2. Install the **J 23523-F** screw into the end for the crankshaft.
 - 5.3. Install the **J 23523-F** bearing, the washer, and the nut onto the **J 23523-F** screw.
 - 5.4. Rotate the **J 23523-F** nut clockwise until the crankshaft balancer hub is completely seated against the crankshaft position sensor reluctor ring.
6. Remove the **J 23523-F**.



G02503090

Fig. 334: Installing Crankshaft Balancer Onto Crankshaft
Courtesy of GENERAL MOTORS CORP.

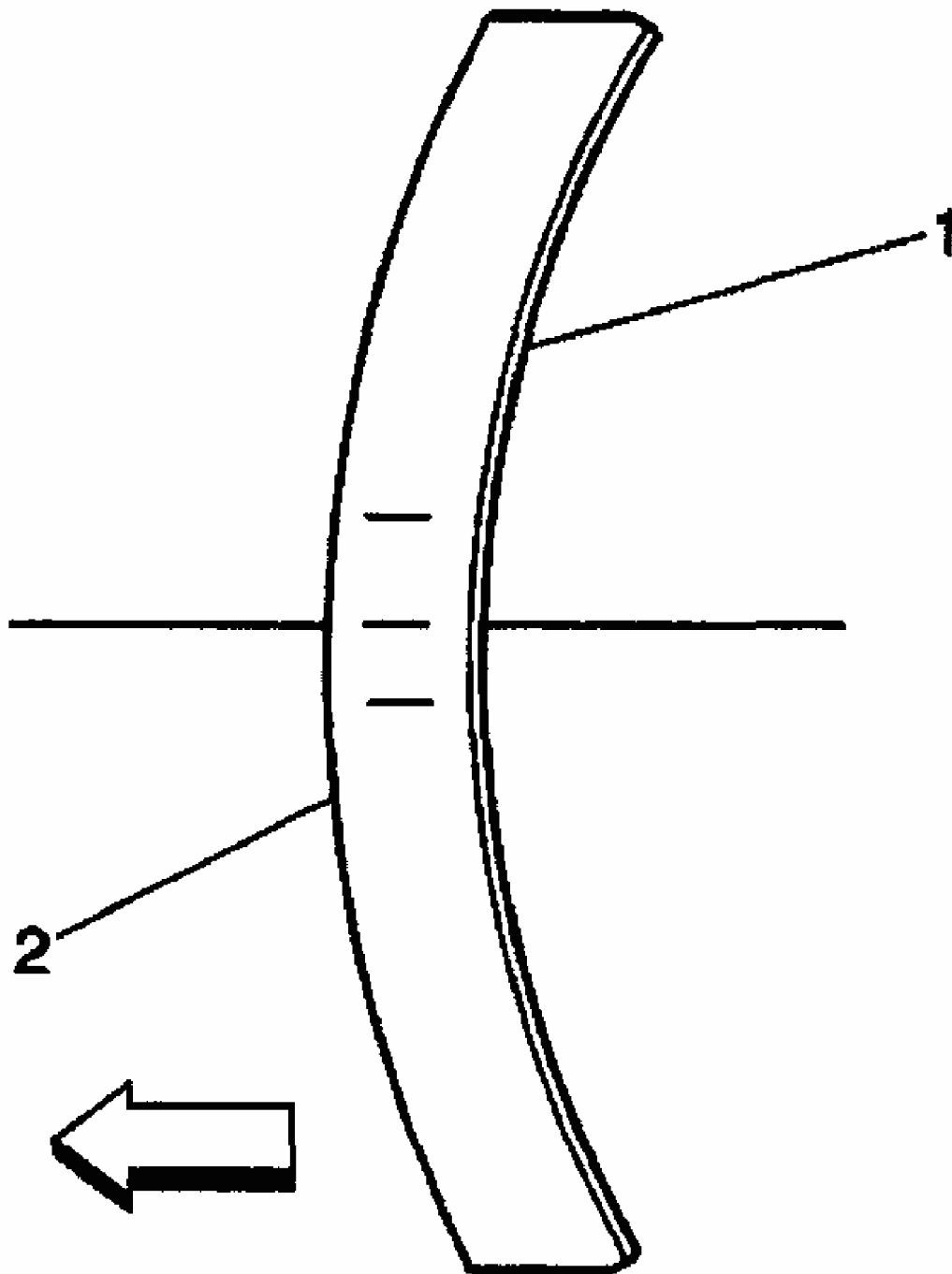
7. Install the crankshaft pulley and bolts. Tighten the crankshaft pulley bolts to 58 N.m (43 Lb ft).



G02503091

Fig. 335: Crankshaft Pulley & Bolts
Courtesy of GENERAL MOTORS CORP.

8. Ensure that the crown of the crankshaft balancer washer (2) is faced away from the engine.



G02503092

Fig. 336: Crankshaft Balancer Washer
Courtesy of GENERAL MOTORS CORP.

9. Install the crankshaft balancer washer and the bolt. Tighten the crankshaft balancer bolt

to 95 N.m (70 Lb ft).

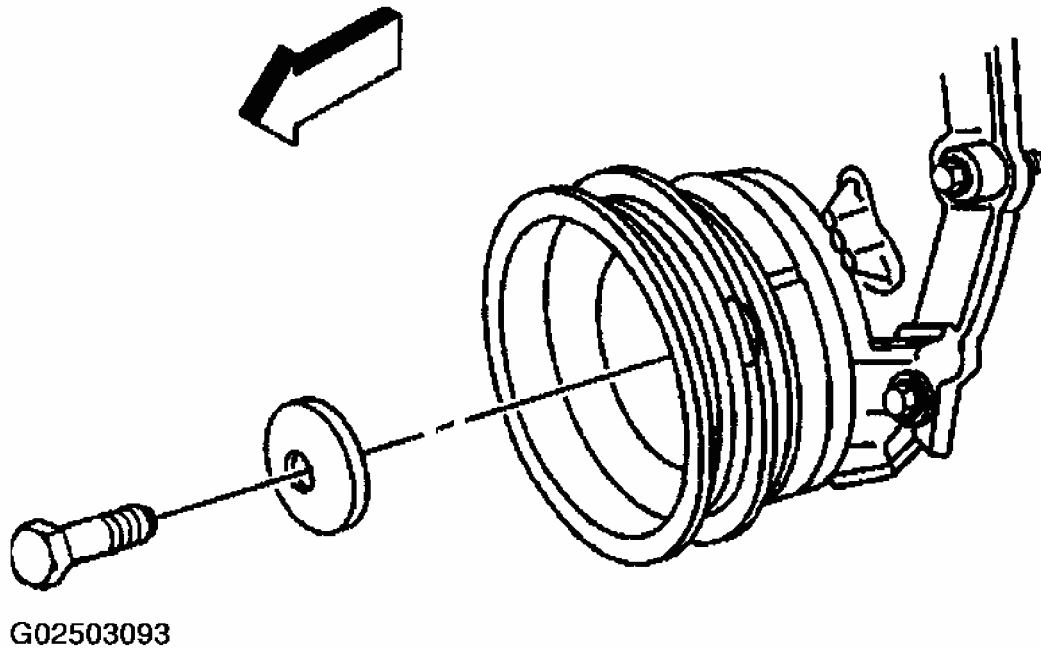


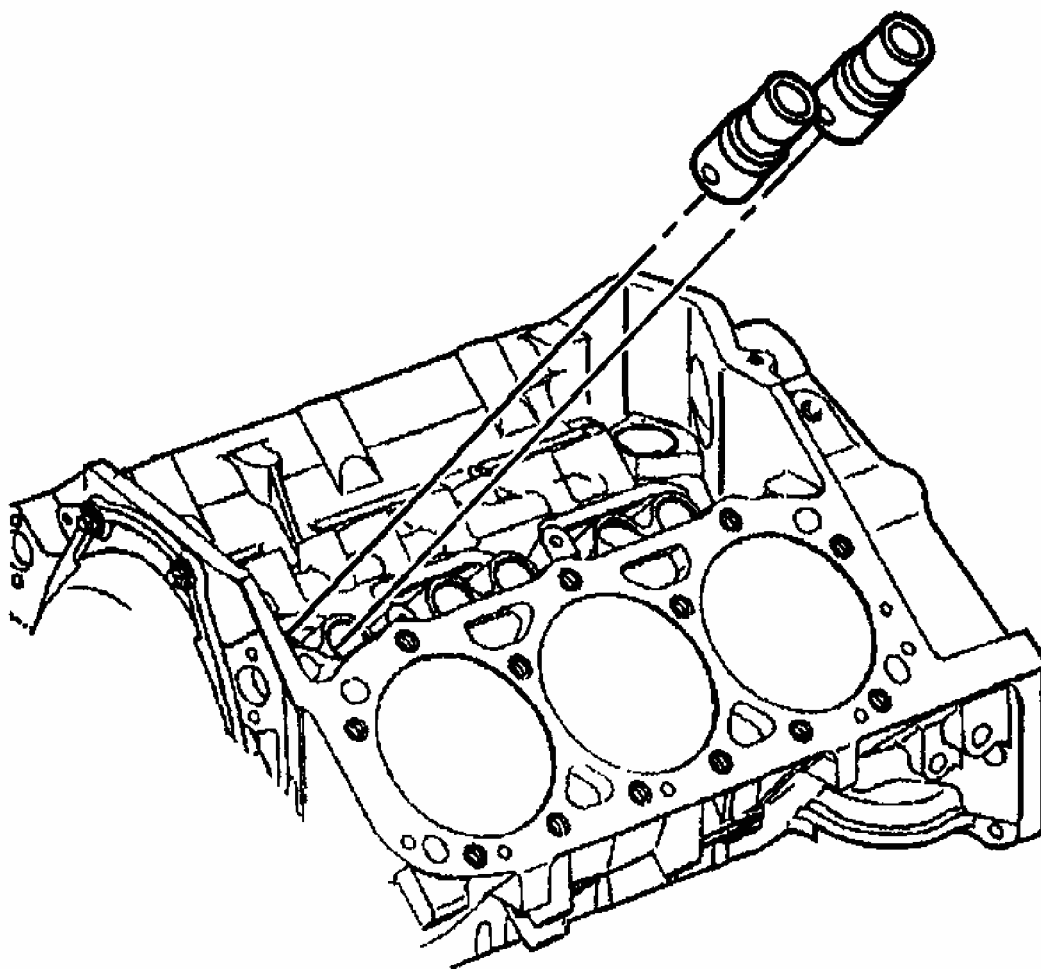
Fig. 337: Crankshaft Balancer Washer & Bolt
Courtesy of GENERAL MOTORS CORP.

VALVE LIFTER INSTALLATION

1. Apply lubricant GM P/N United States 12345501, GM P/N Canada 992704, or equivalent, to the valve lifter rollers.

Important: If reusing the valve lifters, install the valve lifters in the original positions.

2. Install the valve lifters.

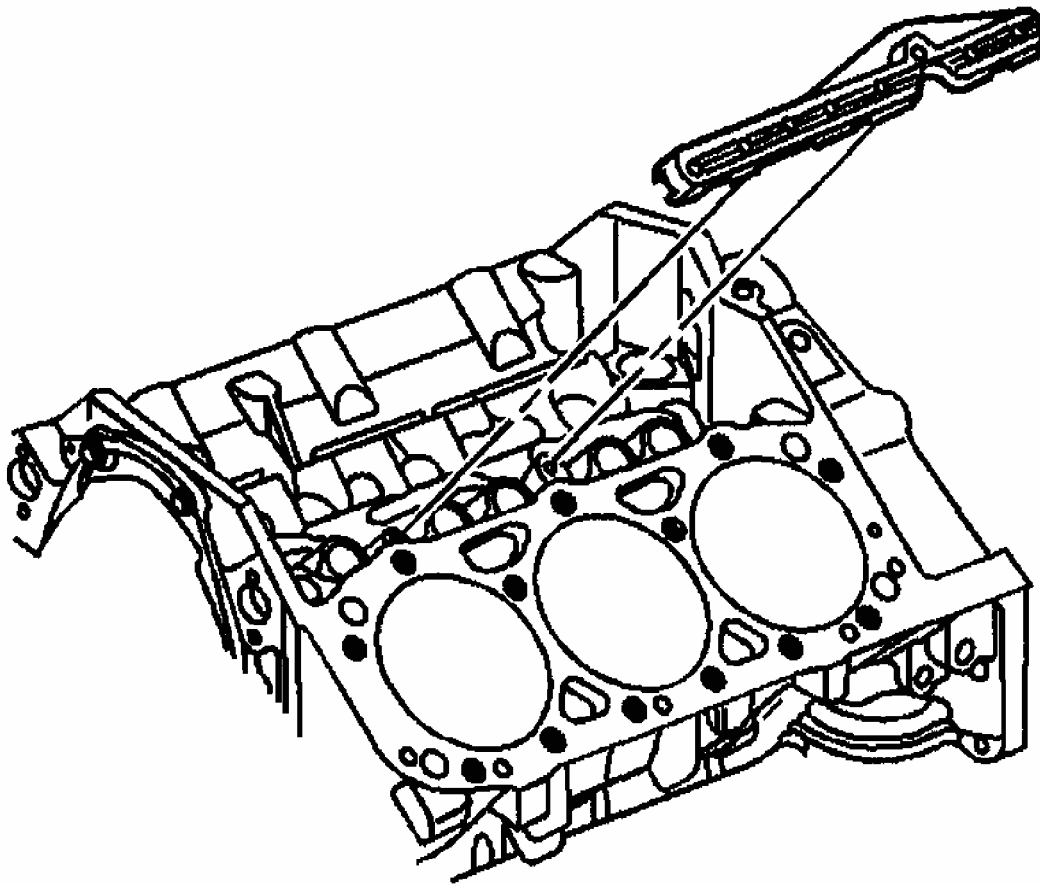


G02503094

Fig. 338: Valve Lifters

Courtesy of GENERAL MOTORS CORP.

3. Install the valve lifter pushrod guides. Tighten the valve lifter pushrod guide bolts to 16 N.m (12 lb ft).



G02503095

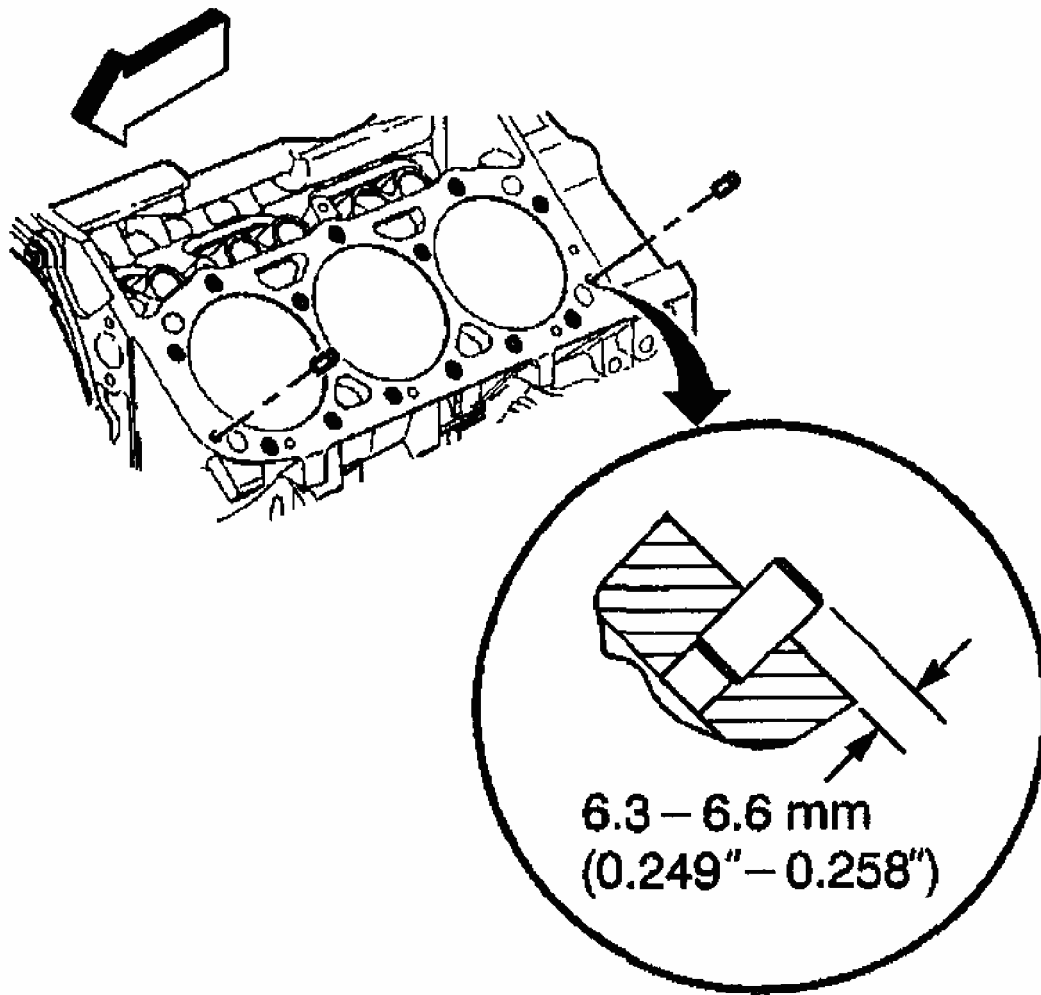
Fig. 339: Valve Lifter Pushrod Guides
Courtesy of GENERAL MOTORS CORP.

CYLINDER HEAD INSTALLATION - LEFT

Tools Required

J 36660-A Torque Angle Meter

1. Clean the cylinder head gasket surfaces on the engine block.
2. Inspect the cylinder head locator dowel pins for proper installation.



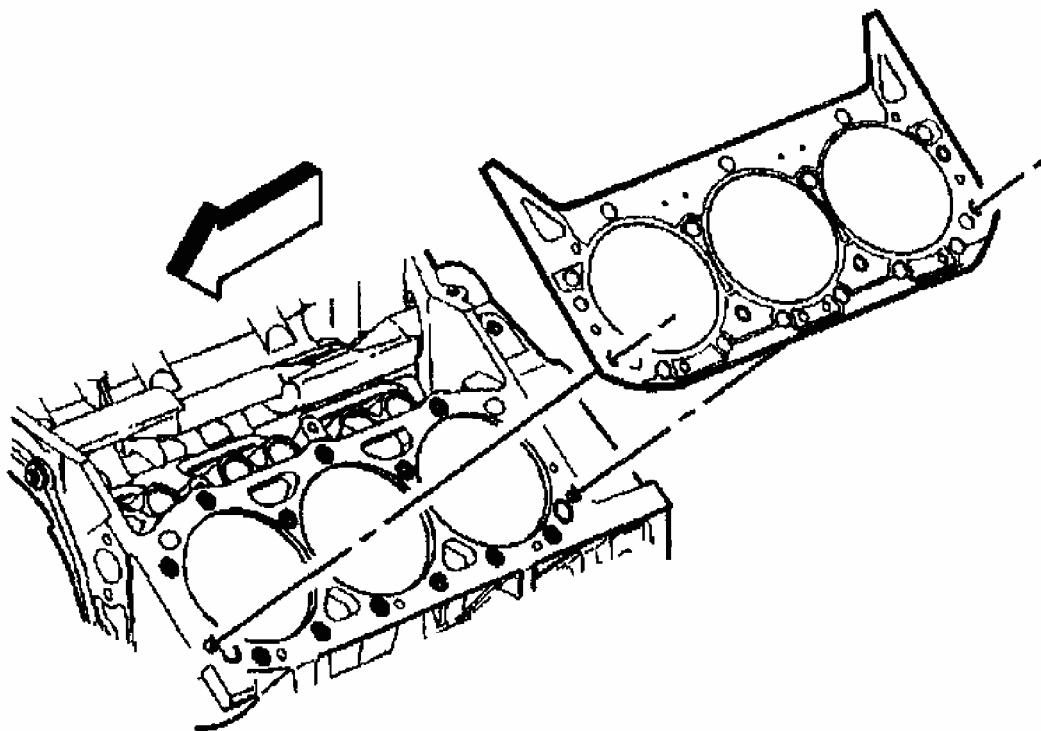
G02503096

Fig. 340: Cylinder Head Locator Dowel Pins
Courtesy of GENERAL MOTORS CORP.

3. Clean the cylinder head gasket surfaces on the cylinder head.

Important: Do not use any type sealer on the cylinder head gasket, unless specified.

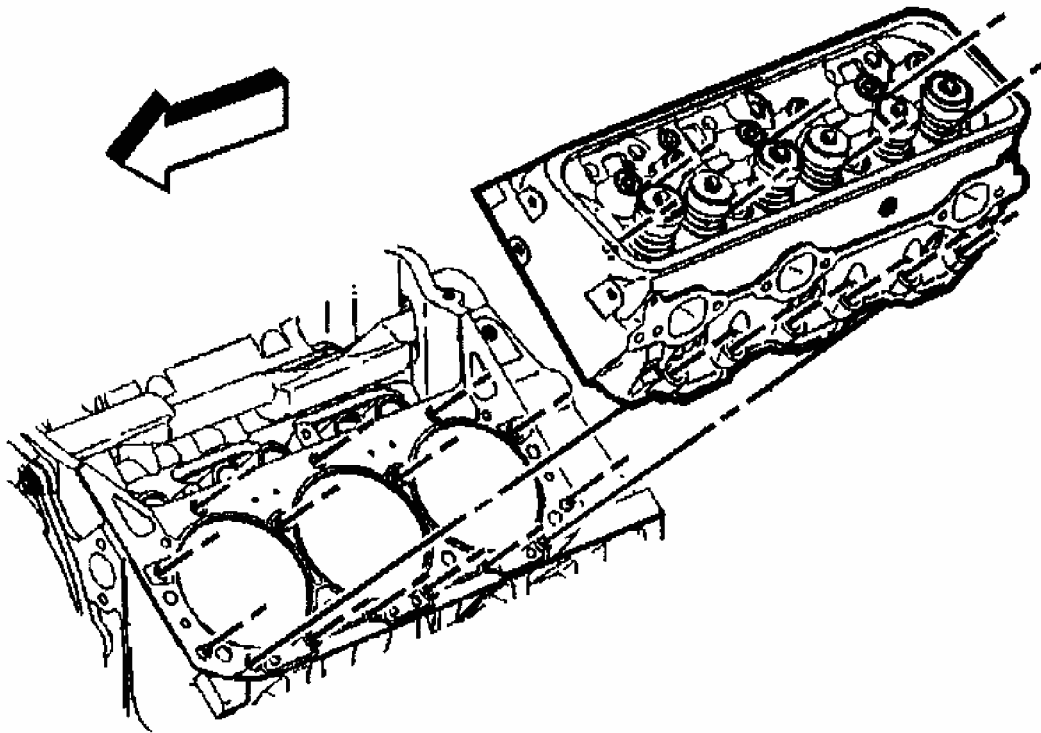
4. Install the NEW cylinder head gasket in position over the cylinder head locator dowel pins.



G02503097

Fig. 341: Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

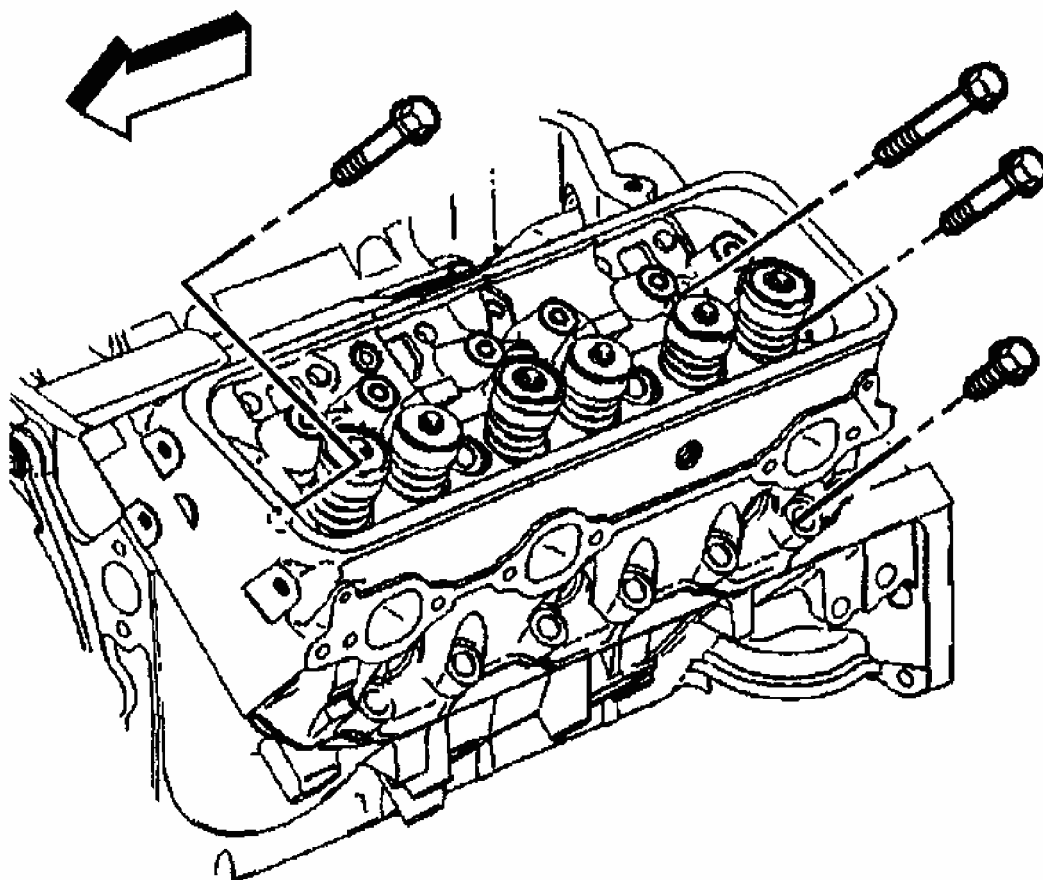
5. Install the cylinder head onto the engine block. Guide the cylinder head carefully into place over the dowel pins and the cylinder head gasket.



G02503098

Fig. 342: Installing Cylinder Head Onto Engine Block
Courtesy of GENERAL MOTORS CORP.

6. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the cylinder head bolts.
7. Install the cylinder head bolts finger tight.



G02503099

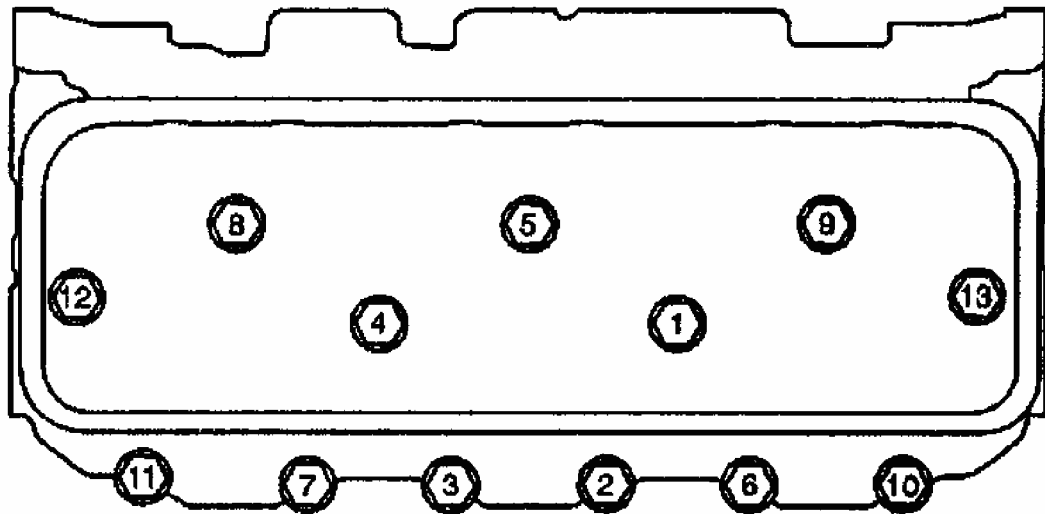
Fig. 343: Cylinder Head Bolts

Courtesy of GENERAL MOTORS CORP.

8. Tighten the cylinder head bolts in sequence on the first pass. Tighten the bolts in sequence on the first pass to 30 N.m (22 Lb ft).
9. Use the **J 36660-A** in order to tighten the cylinder head bolts in sequence on the final pass.
 - Tighten the long bolts (1, 4, 5, 8, and 9) on the final pass in sequence to 75 degrees.
 - Tighten the medium bolts (12 and 13) on the final pass in sequence to 65 degrees.
 - Tighten the short bolts (2, 3, 6, 7, 10, and 11) on the final pass in sequence to 55 degrees.

2001 Chevrolet S10 Pickup

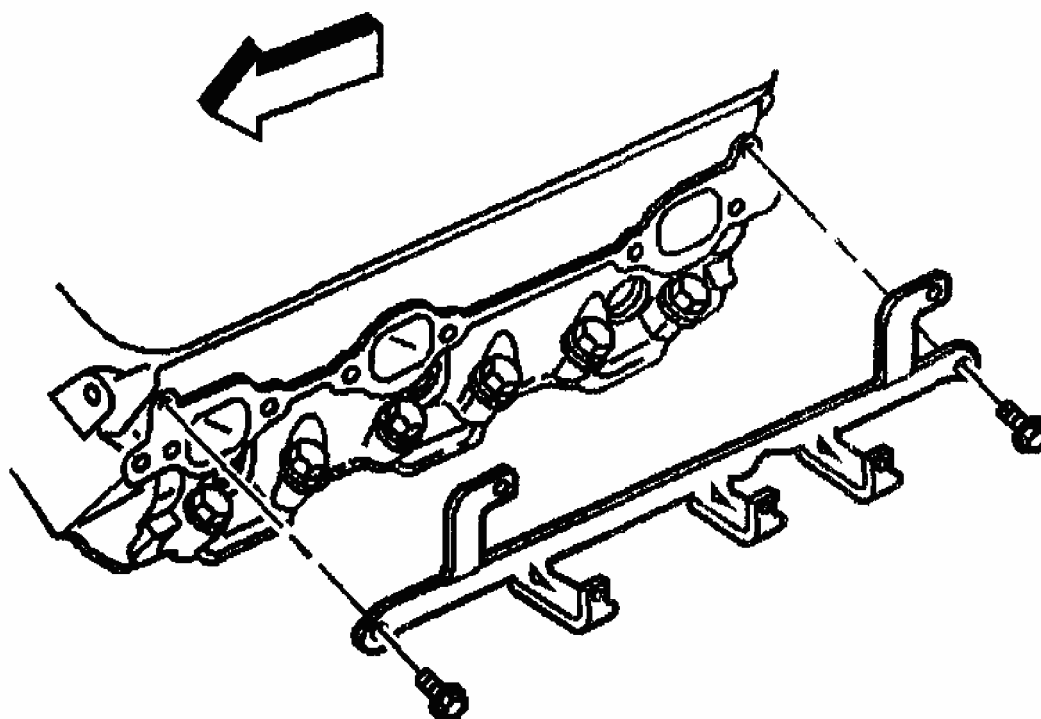
2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)



G02503100

Fig. 344: Cylinder Head Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

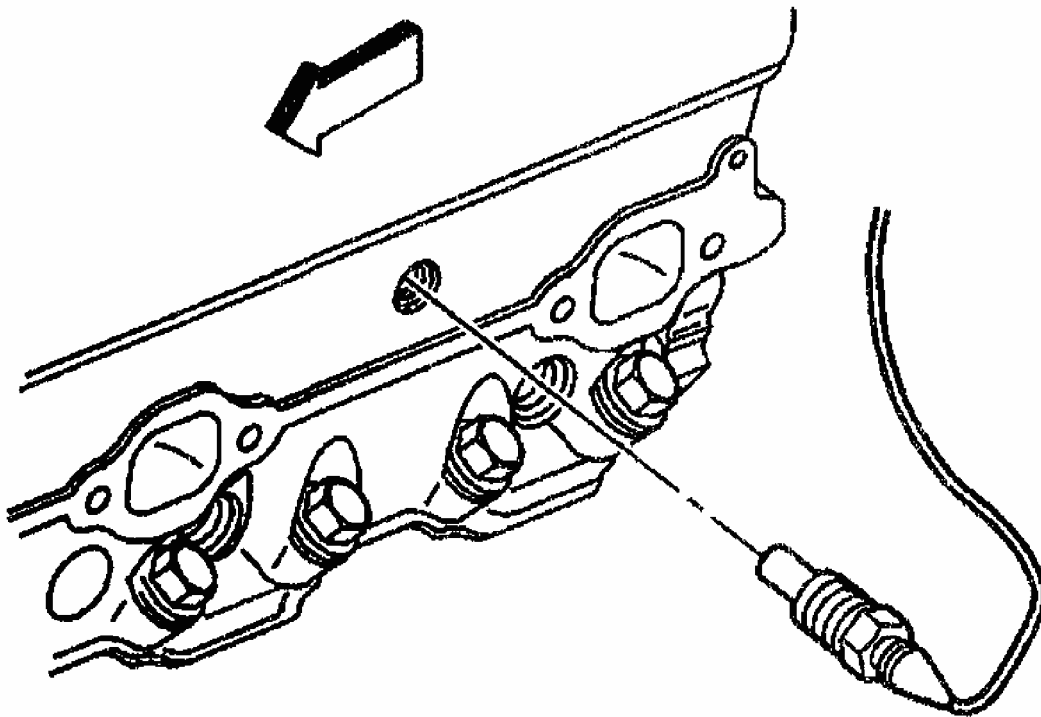
10. Install the spark plug wire support and bolts. Tighten the spark plug wire support bolts to 12 N.m (106 lb in).



G02503101

Fig. 345: Spark Plug Wire Support
Courtesy of GENERAL MOTORS CORP.

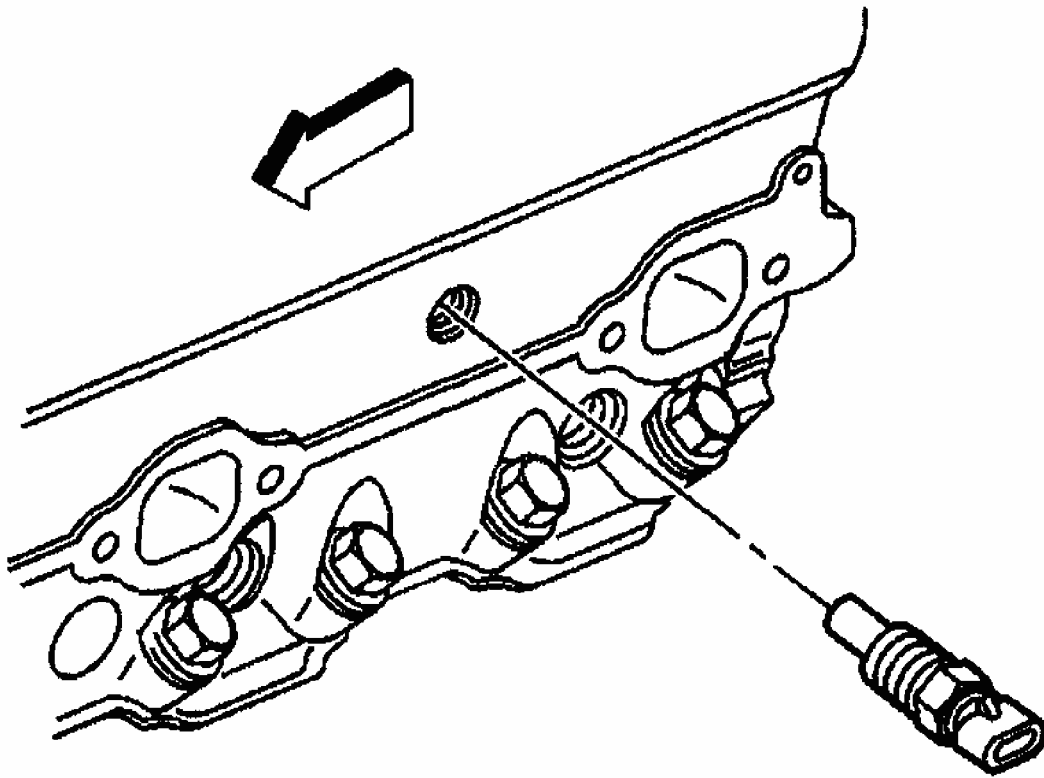
11. Measure the NEW spark plugs for the proper gap. Adjust the spark plug gap if necessary. Spark plug gap to 1.52 mm (0.060 in).
12. Install the spark plugs.
 - Tighten the spark plugs for a USED cylinder head to 15 N.m (11 Lb ft).
 - Tighten the spark plugs for the initial installation of a NEW cylinder head to 30 N.m (22 Lb ft).
13. If reusing the engine coolant temperature gage sensor, if applicable, apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the engine coolant temperature gage sensor.
14. Install the engine coolant temperature gage sensor, if applicable. Tighten the engine coolant temperature gage sensor to 20 N.m (15 Lb ft).



G02503103

Fig. 346: Engine Coolant Temperature Gage Sensor
Courtesy of GENERAL MOTORS CORP.

15. If reusing the engine coolant temperature sensor, if applicable, apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the engine coolant temperature gage sensor.
16. Install the engine coolant temperature sensor, if applicable. Tighten the engine coolant temperature sensor to 20 N.m (15 lb ft).



G02503104

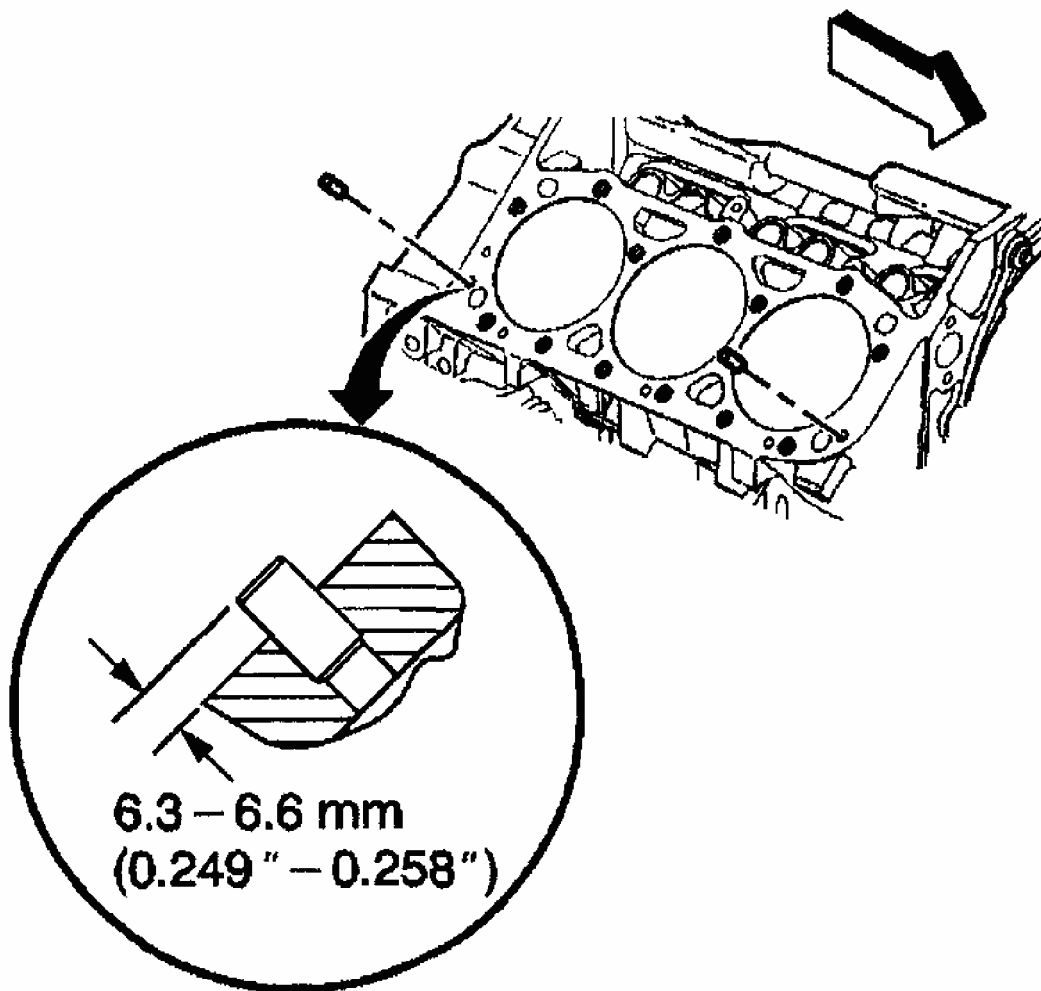
Fig. 347: Engine Coolant Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

CYLINDER HEAD INSTALLATION - RIGHT

Tools Required

J 36660-A Torque Angle Meter

1. Clean the cylinder head gasket surfaces on the engine block.
2. Inspect the cylinder head locator dowel pins for proper installation.



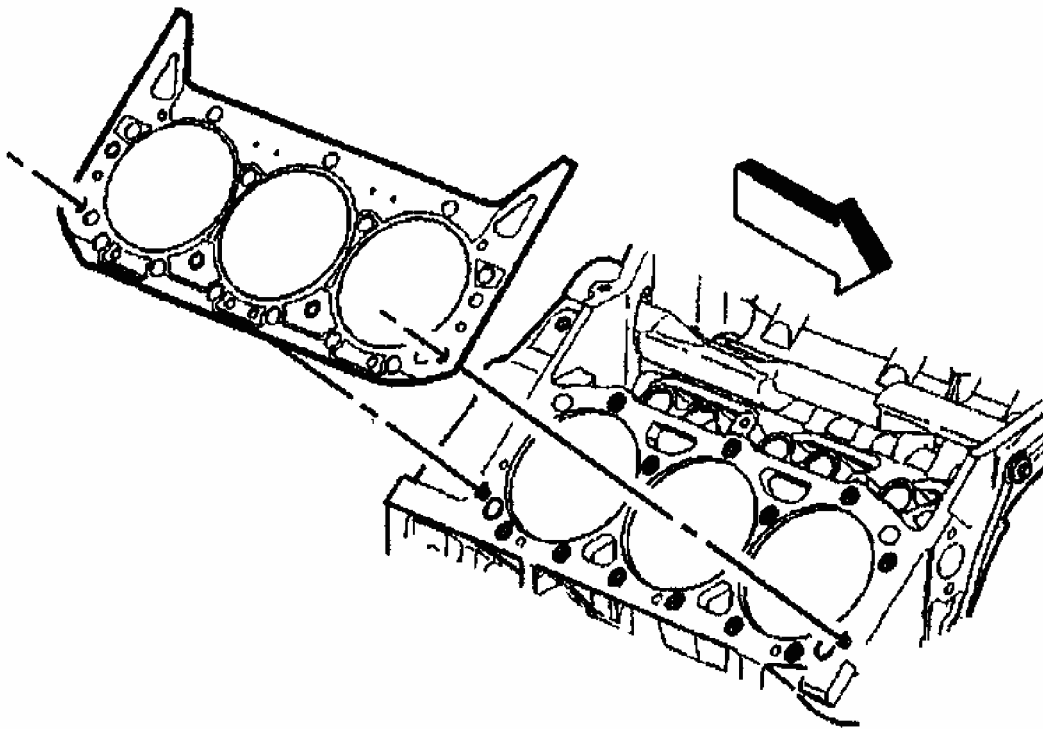
G02503105

Fig. 348: Cylinder Head Locator Dowel Pins
Courtesy of GENERAL MOTORS CORP.

3. Clean the cylinder head gasket surfaces on the cylinder head.

Important: Do not use any type sealer on the cylinder head gasket, unless specified.

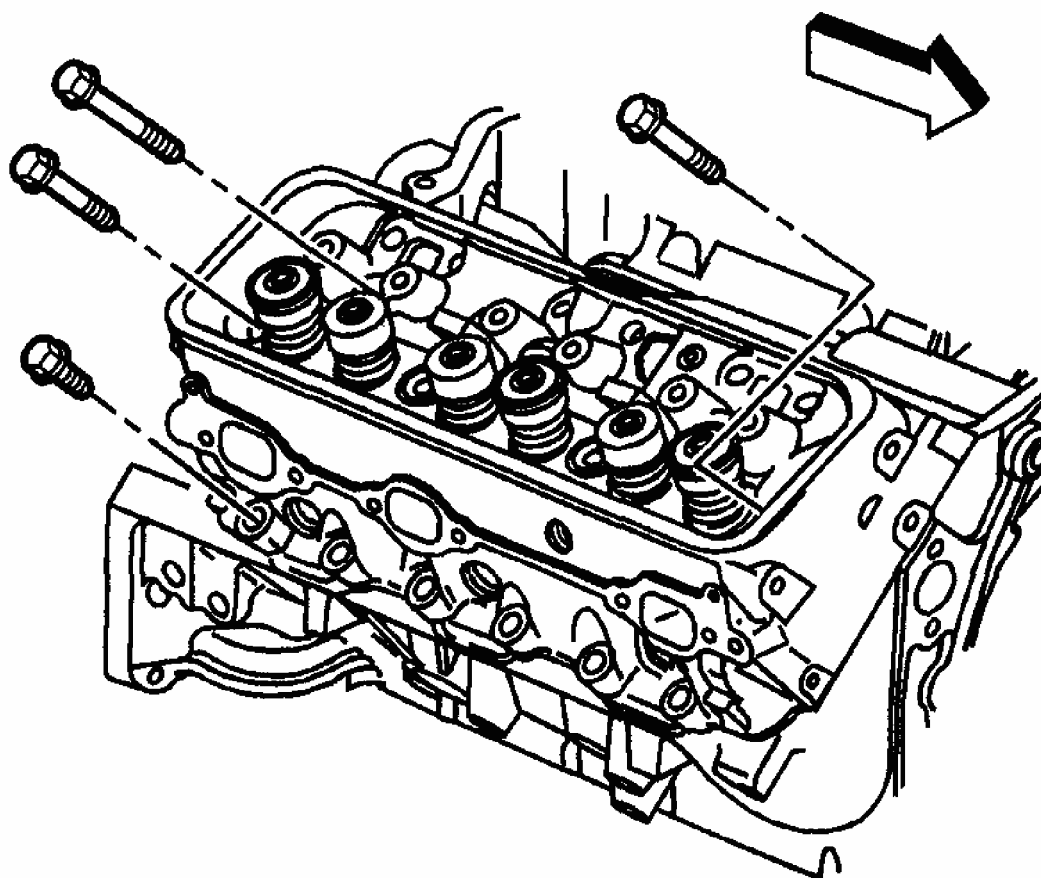
4. Install the NEW cylinder head gasket in position over the cylinder head locator dowel pins.



G02503106

Fig. 349: Cylinder Head Gasket
Courtesy of GENERAL MOTORS CORP.

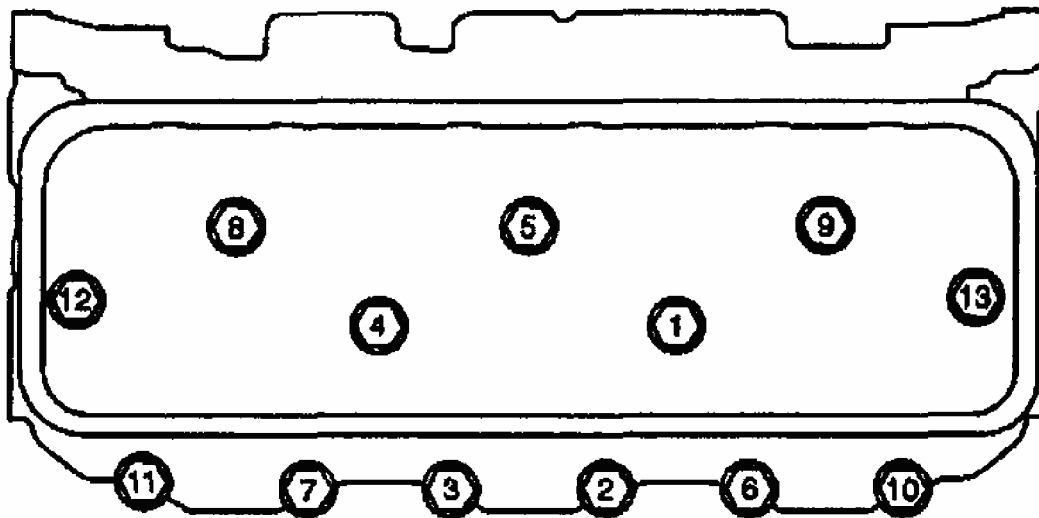
5. Install the cylinder head onto the engine block. Guide the cylinder head carefully into place over the dowel pins and the cylinder head gasket.
6. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the cylinder head bolts.
7. Install the cylinder head bolts finger tight.



G02503108

Fig. 350: Cylinder Head Bolts
Courtesy of GENERAL MOTORS CORP.

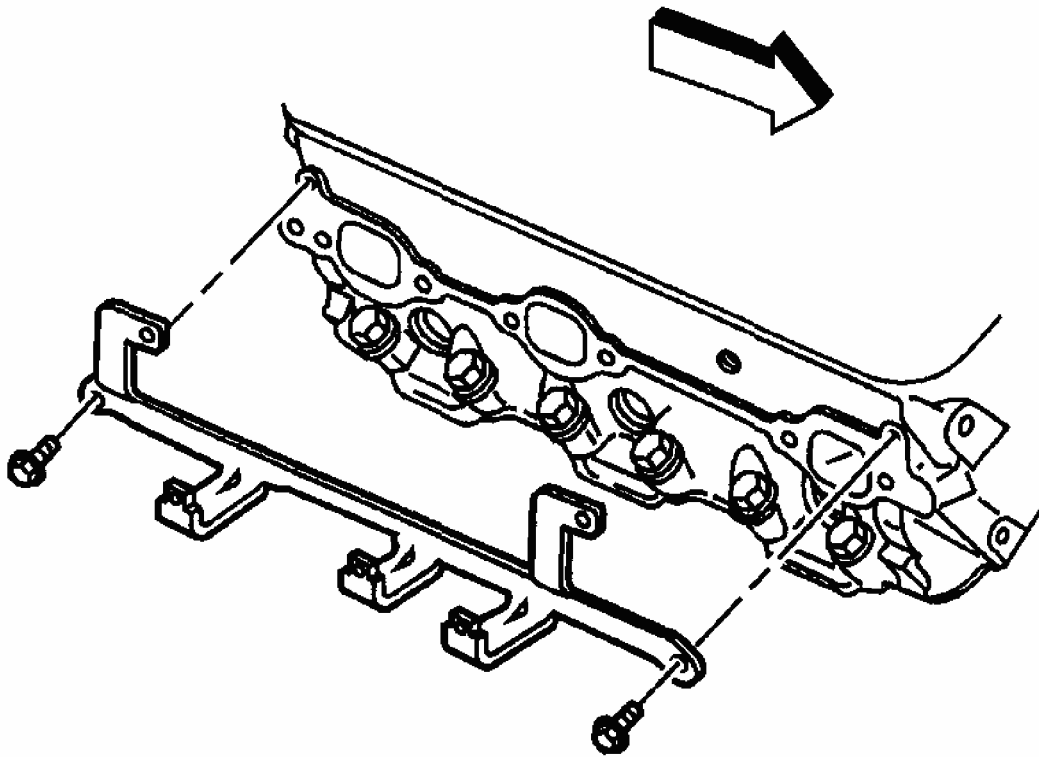
8. Tighten the cylinder head bolts in sequence on the first pass. Tighten the bolts in sequence on the first pass to 30 N.m (22 Lb ft).
9. Use the **J 36660-A** in order to tighten the cylinder head bolts in sequence on the final pass.
 - Tighten the long bolts (1, 4, 5, 8, and 9) on the final pass in sequence to 75 degrees.
 - Tighten the medium bolts (12 and 13) on the final pass in sequence to 65 degrees.
 - Tighten the short bolts (2, 3, 6, 7, 10, and 11) on the final pass in sequence to 55 degrees.



G02503109

Fig. 351: Cylinder Head Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

10. Install the spark plug wire support and bolts. Tighten only the rear spark plug wire support bolt to 12 N.m (106 lb in).
11. Remove the front spark plug wire support bolt. The front spark plug wire support bolt is used to fasten the oil level indicator tube, and will be installed within the oil level indicator tube installation procedure.



G02503110

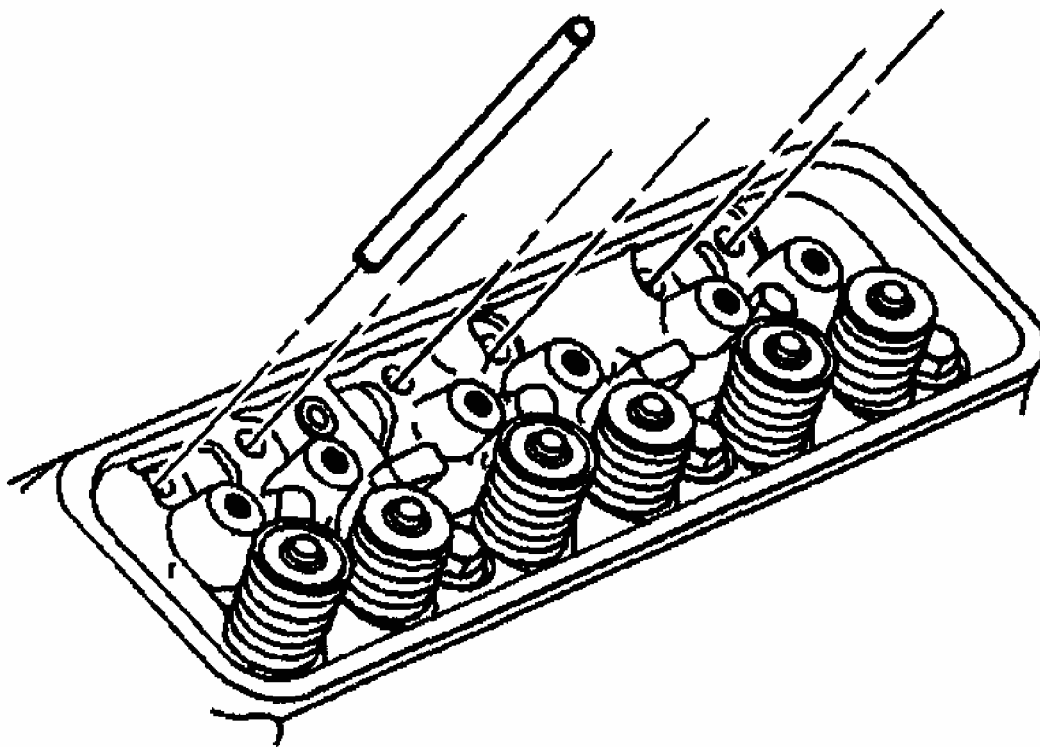
Fig. 352: Spark Plug Wire Support
Courtesy of GENERAL MOTORS CORP.

12. Measure the NEW spark plugs for the proper gap. Adjust the spark plug gap if necessary. Spark plug gap to 1.52 mm (0.060 in).
13. Install the spark plugs.
 - Tighten the spark plugs for a USED cylinder head to 15 N.m (11 Lb ft).
 - Tighten the spark plugs for the initial installation of a NEW cylinder head to 30 N.m (22 Lb ft).

VALVE ROCKER ARM & PUSH ROD INSTALLATION

Important: Be sure to keep parts in order. Parts must be reinstalled into the original location and position.

1. Install the valve pushrods.

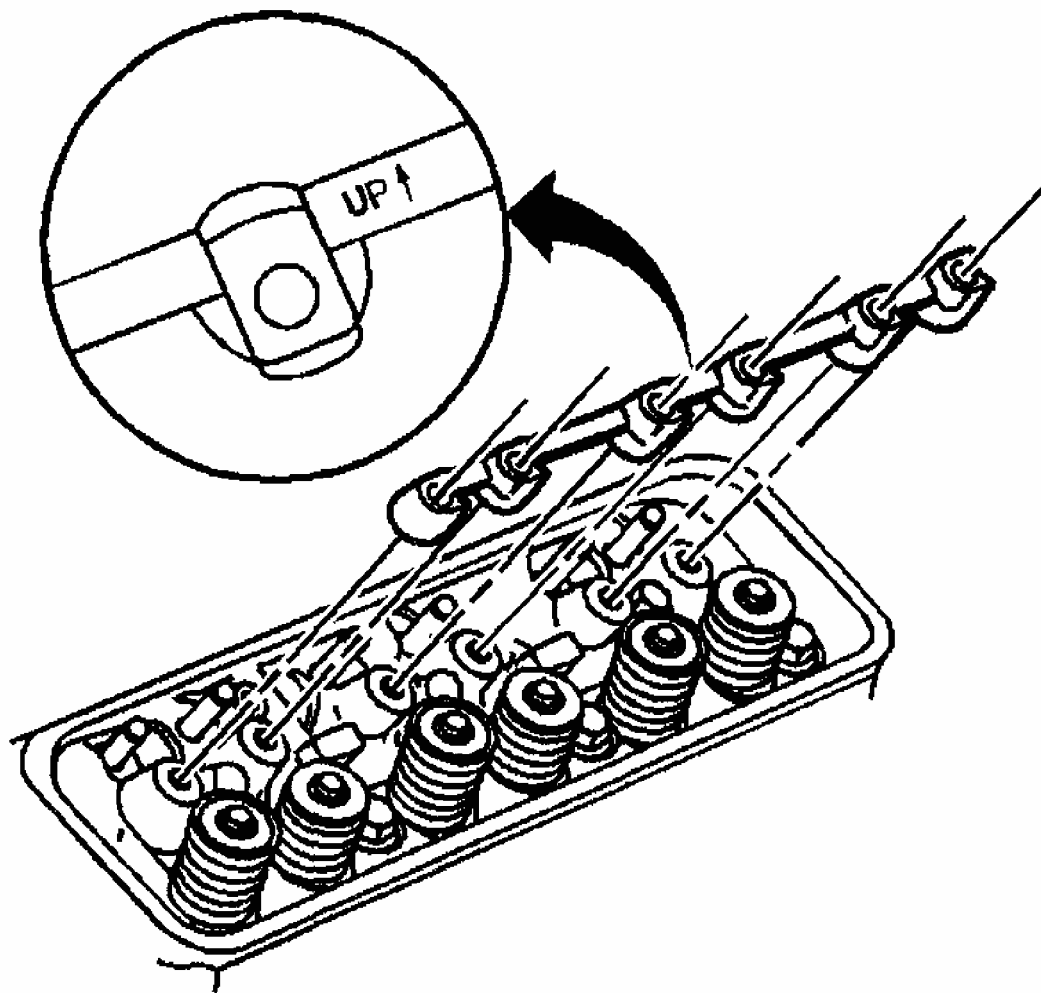


G02503112

Fig. 353: Valve Pushrods
Courtesy of GENERAL MOTORS CORP.

Important: Be sure that the arrow on the valve rocker arm support is in the up position.

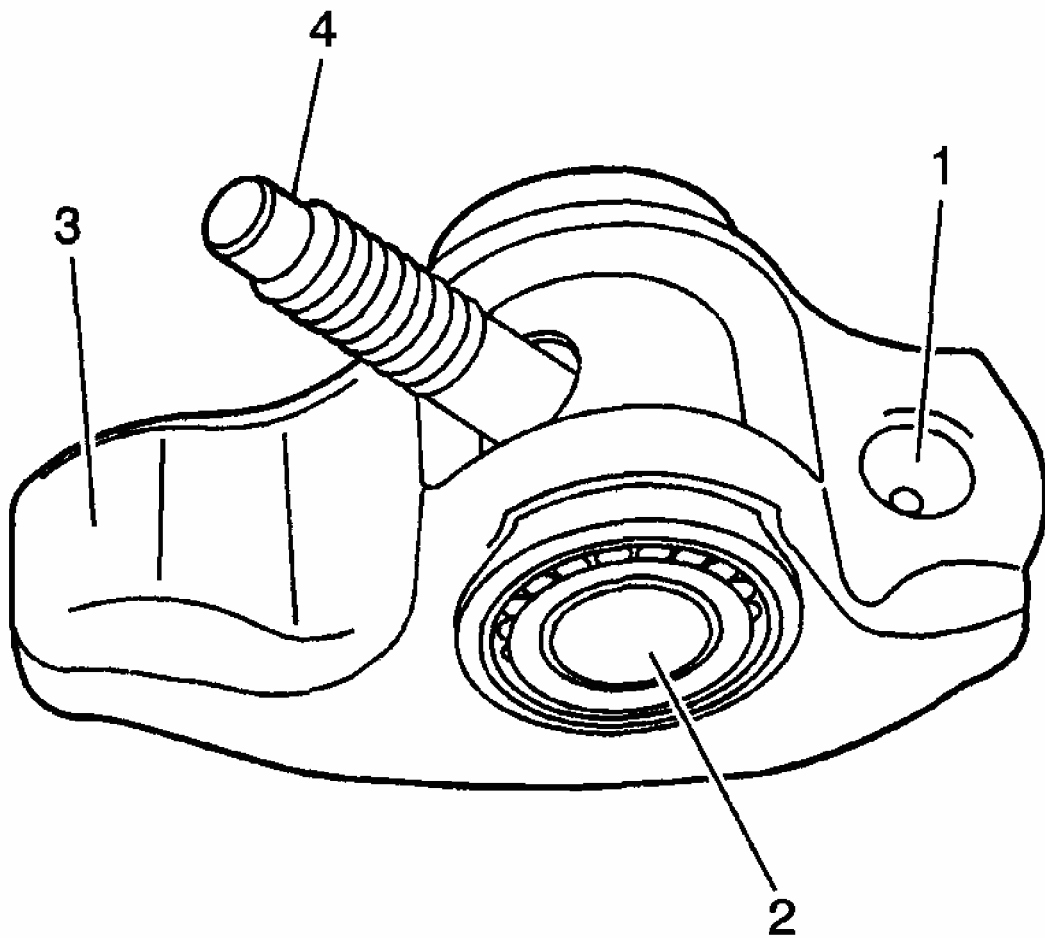
2. Install the valve rocker arm supports.



G02503113

Fig. 354: Valve Rocker Arm Supports
Courtesy of GENERAL MOTORS CORP.

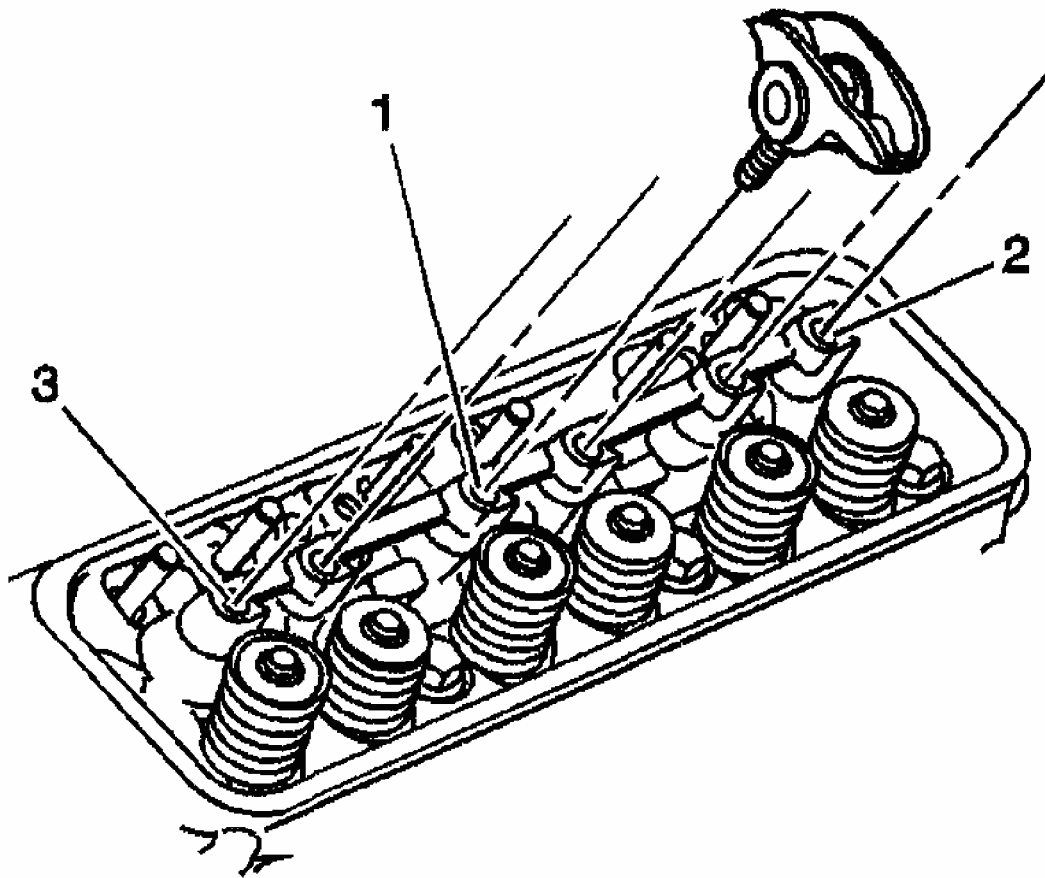
3. Apply prelube GM P/N United States 12345501, GM P/N Canada 992704, or equivalent, to the following valve rocker arm contact surfaces:
 - Valve pushrod socket (1)
 - Roller pivot (2)
 - Valve stem tip (3)



G02503114

Fig. 355: Valve Rocker Arm Assembly
Courtesy of GENERAL MOTORS CORP.

4. Install the valve rocker arm assemblies as follows:
 - 4.1. Finger start the bolt at location (1)
 - 4.2. Finger start the bolt at location (2)
 - 4.3. Finger start the bolt at location (3)
 - 4.4. Finger start the remaining valve rocker arm bolts

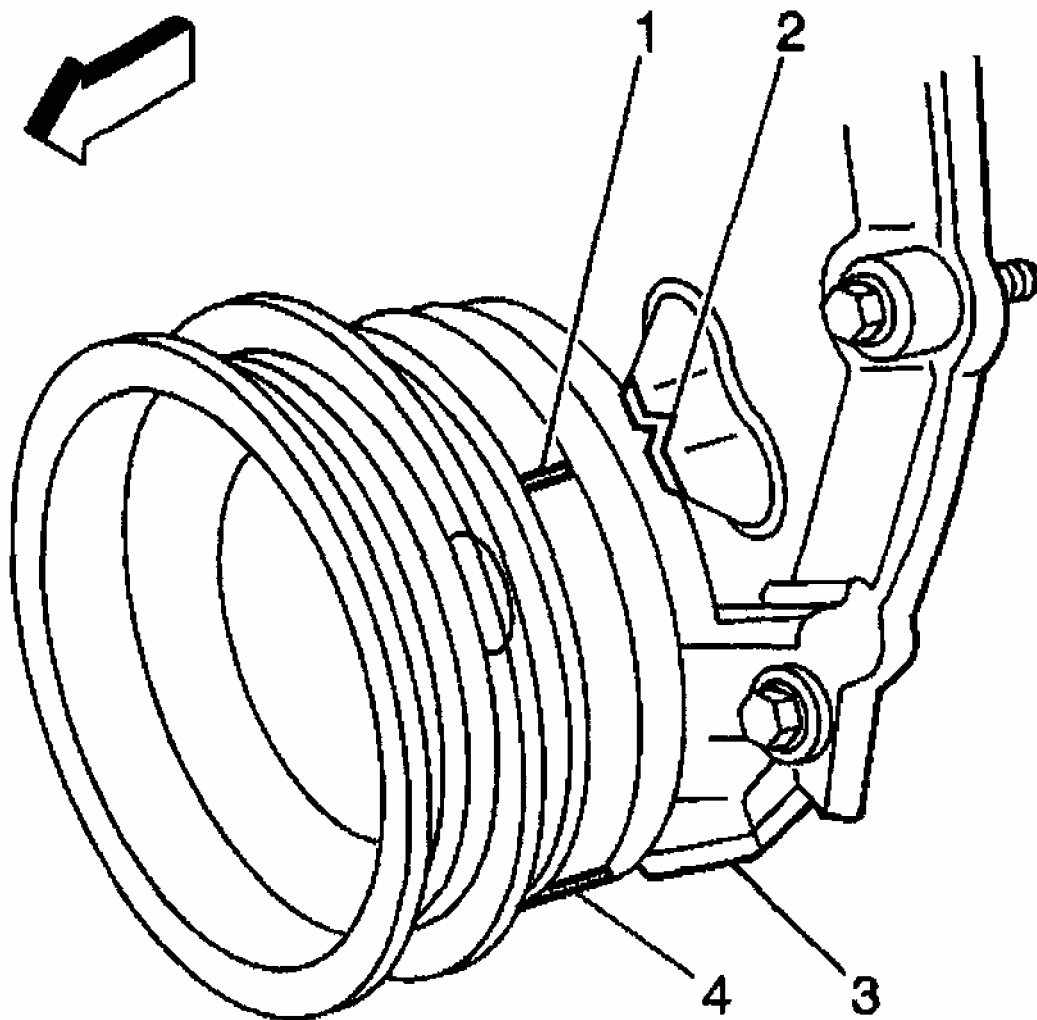


G02503115

Fig. 356: Installing Valve Rocker Arm
Courtesy of GENERAL MOTORS CORP.

5. Rotate the crankshaft balancer to position the crankshaft balancer alignment mark (1) 57-63 degrees clockwise or counterclockwise from the engine front cover alignment tab (2).

Important: Once the valve rocker arm assemblies are installed and properly torqued, no additional valve lash adjustment is required.



G02503116

Fig. 357: Crankshaft Balancer Alignment Mark
Courtesy of GENERAL MOTORS CORP.

6. Tighten the valve rocker arm bolts. Tighten valve rocker arm bolts to 30 N.m (22 Lb ft).

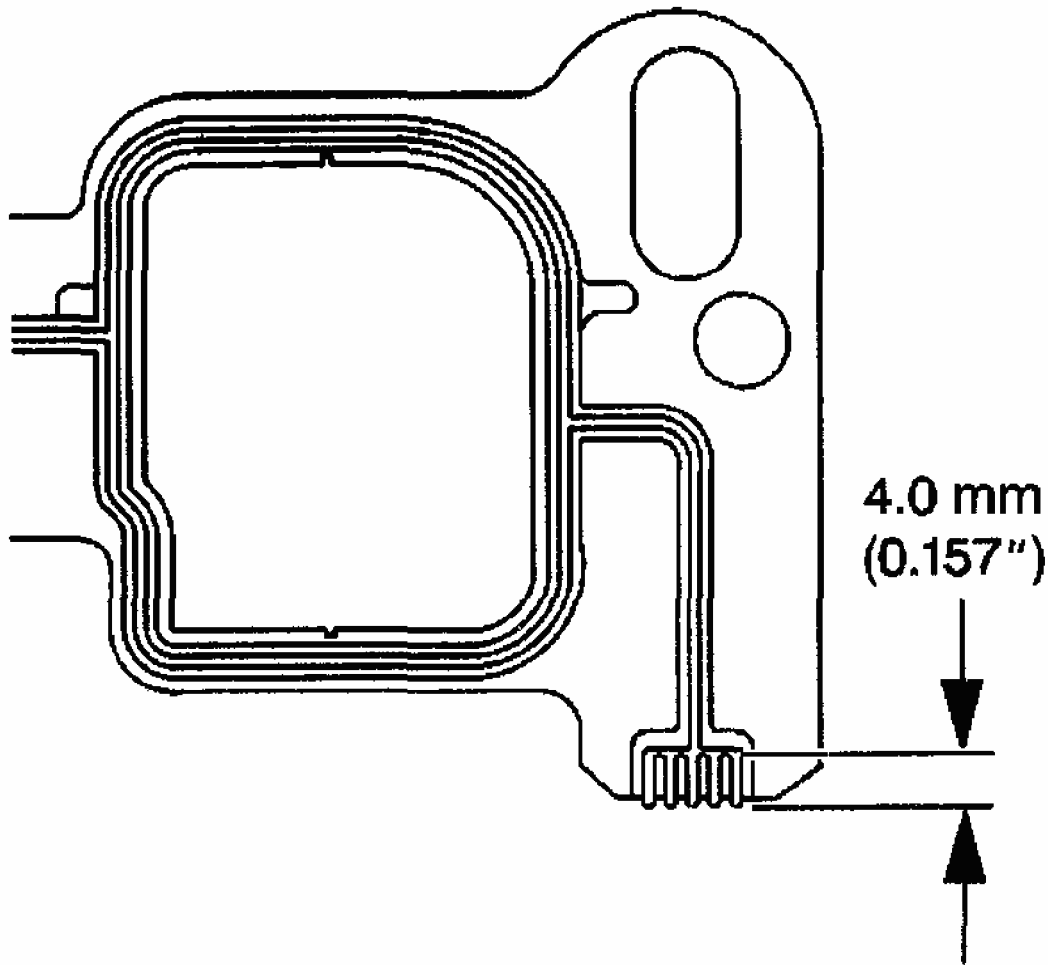
INTAKE MANIFOLD INSTALLATION

NOTE: Apply the proper amount of the sealant when assembling this component. Excessive use of the sealant can prohibit the component from sealing properly. A component that is not sealed properly can leak leading to extensive engine damage.

1. Apply a 4.0 mm (0.157 in) patch of adhesive GM P/N United States 12346141, GM

P/N Canada 10953433, or equivalent, to the cylinder head side of the lower intake manifold gasket at each end.

Important: The lower intake manifold gasket must be installed while the adhesive is still wet to the touch.



G02503117

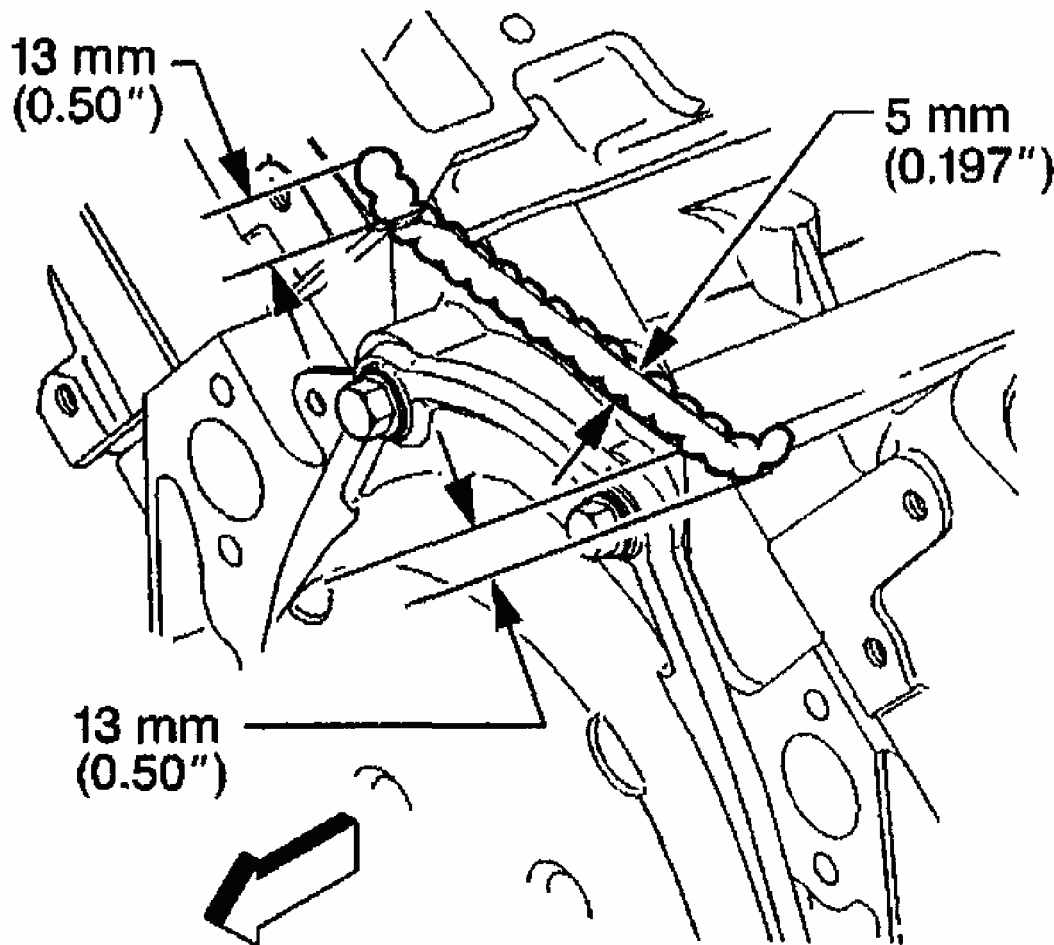
Fig. 358: Applying Adhesive To Cylinder Head Side Of Lower Intake Manifold Gasket

Courtesy of GENERAL MOTORS CORP.

2. Install the lower intake manifold gasket onto the cylinder head. Use the gasket locator pins in order to properly seat the lower intake manifold gasket on the cylinder head.

Important: The lower intake manifold must be installed and the fasteners tightened while the adhesive is still wet to the touch.

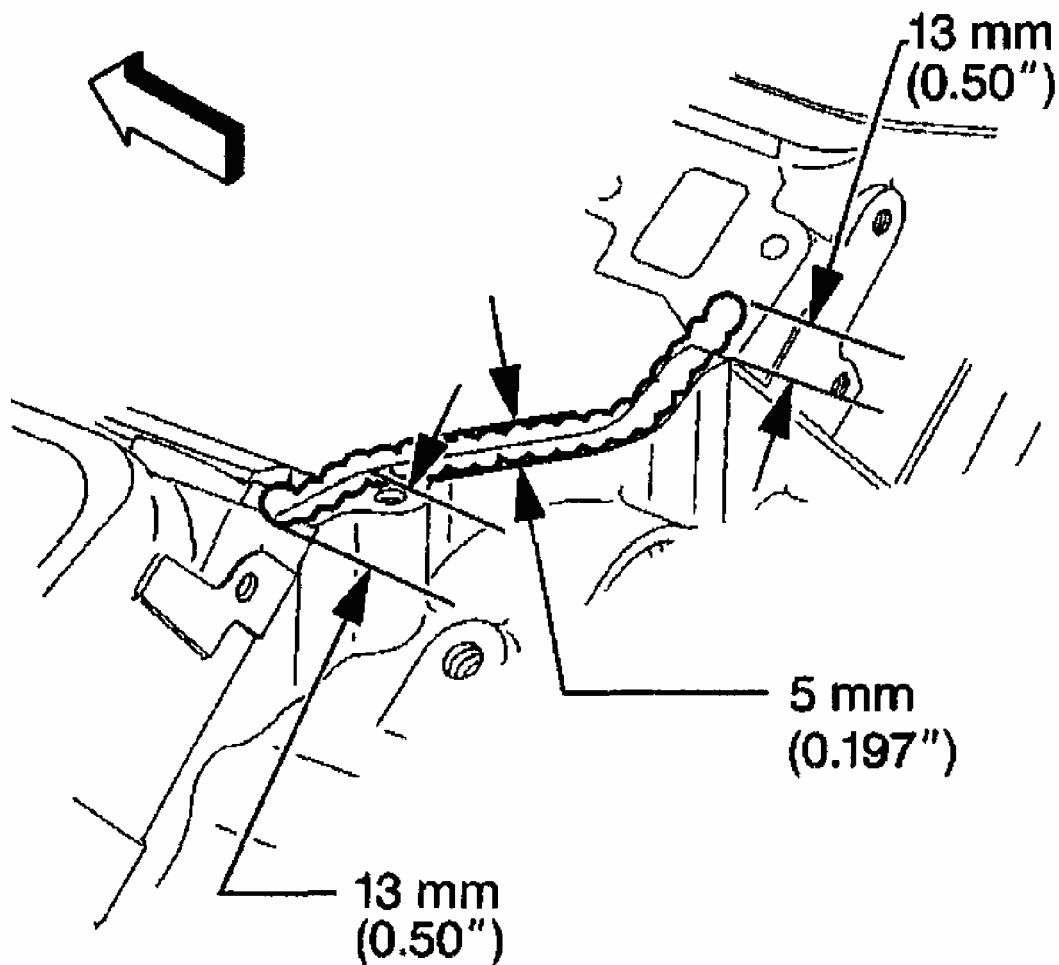
3. Apply a 5 mm (0.197 in) bead of adhesive GM P/N United States 12346141, GM P/N Canada 10953433, or equivalent, to the front top of the engine block.
4. Extend the adhesive bead 13 mm (0.50 in) onto each lower intake manifold gasket.



G02503118

Fig. 359: Applying Adhesive Bead Onto Each Lower Intake Manifold Gasket
Courtesy of GENERAL MOTORS CORP.

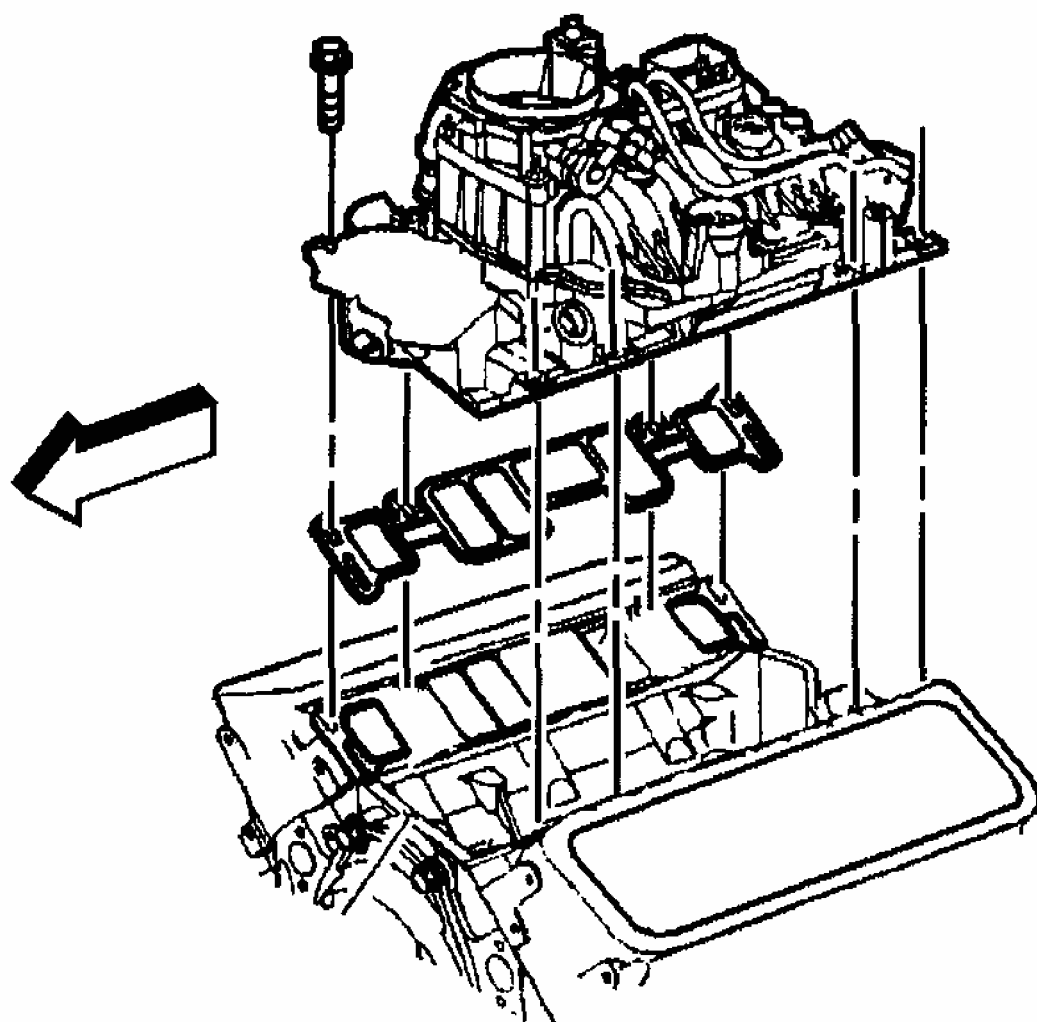
5. Apply a 5 mm (0.197 in) bead of adhesive GM P/N United States 12346141, GM P/N Canada 10953433, or equivalent, to the rear top of the engine block.
6. Extend the adhesive bead 13 mm (0.50 in) onto each lower intake manifold gasket.



G02503119

Fig. 360: Applying Adhesive Bead Onto Each Lower Intake Manifold Gasket
Courtesy of GENERAL MOTORS CORP.

7. Install the lower intake manifold onto the engine block.
8. If reusing the fasteners, apply threadlock GM P/N United States 12345382, GM P/N Canada 10953489, or equivalent, to the threads of the lower intake manifold bolts.
9. Install the lower intake manifold bolts.



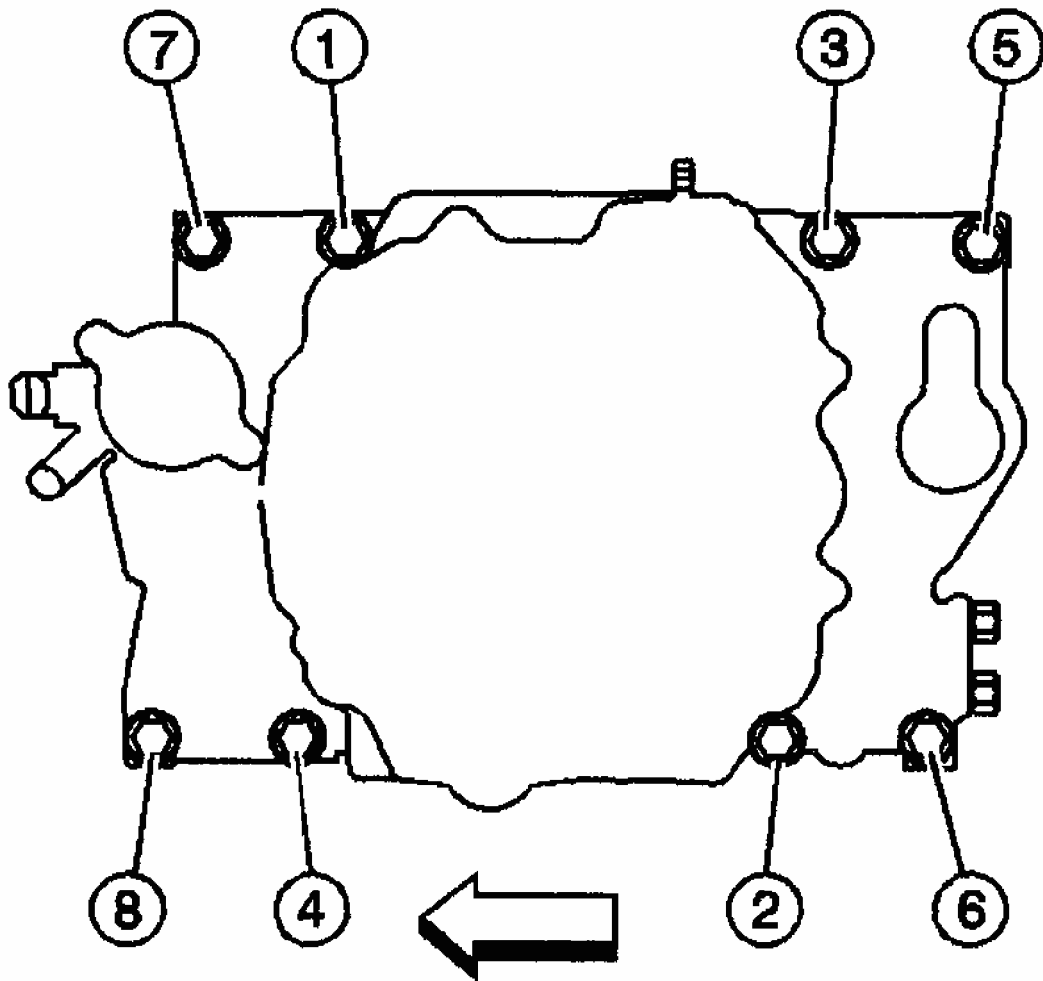
G02503120

Fig. 361: Installing Lower Intake Manifold
Courtesy of GENERAL MOTORS CORP.

NOTE: Proper lower intake manifold fastener tightening sequence and torque is critical. Always follow the tightening sequence, and torque the intake manifold bolts using the 3 step method. Failing to do so may distort the crankshaft bearing bore alignment and cause damage to the crankshaft bearings.

10. Tighten the lower intake manifold bolts.
 - 10.1. Tighten the bolts on the first pass in sequence (1-8) to 3 N.m (27 lb in).
 - 10.2. Tighten the bolts on the second pass in sequence (1-8) to 12 N.m (106 lb in).

10.3. Tighten the bolts on the final pass in sequence (1-8) to 15 N.m (11 Lb ft).



G02503121

Fig. 362: Lower Intake Manifold Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

11. Connect the evaporative emission (EVAP) canister solenoid valve harness.
 - 11.1. Push the elbow inward until the quick connect snaps into place.
 - 11.2. Pull the elbow outward in order to ensure proper connection.

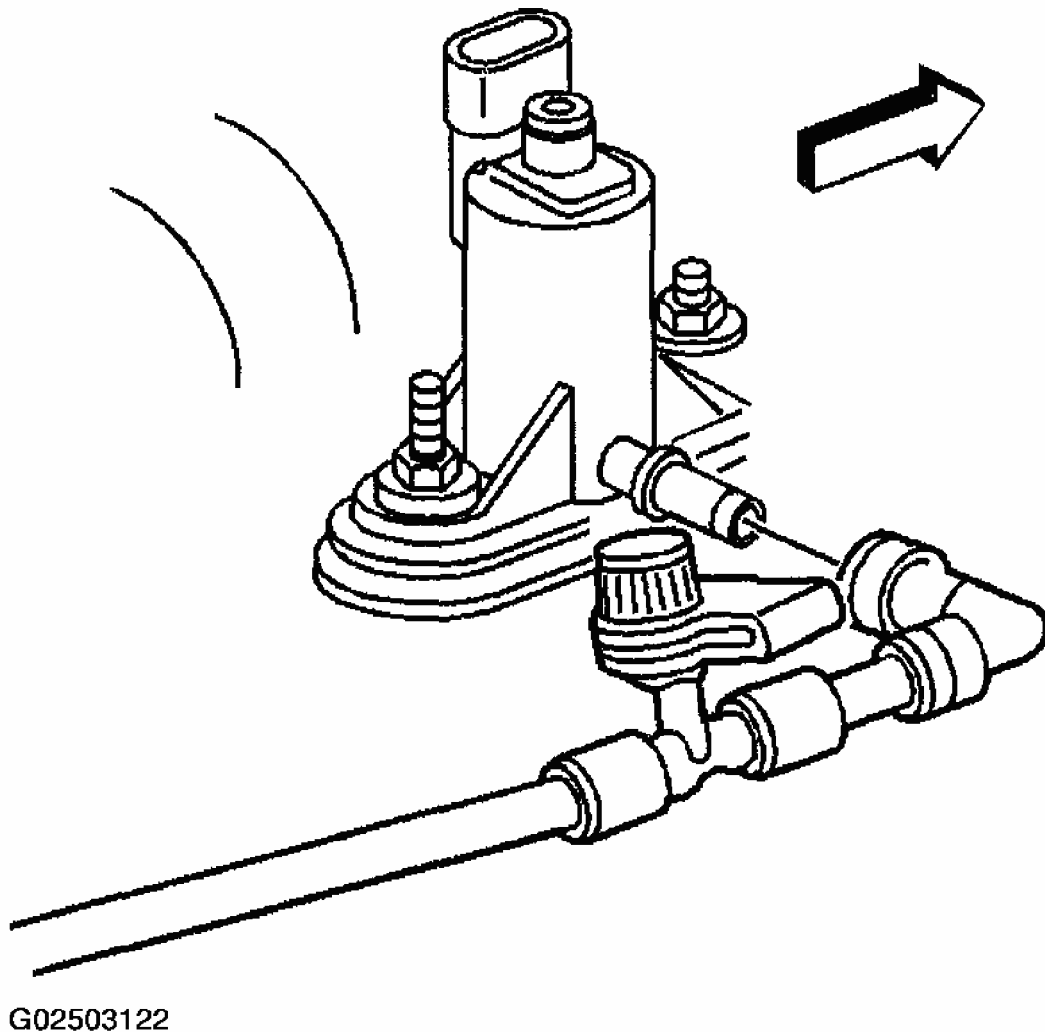
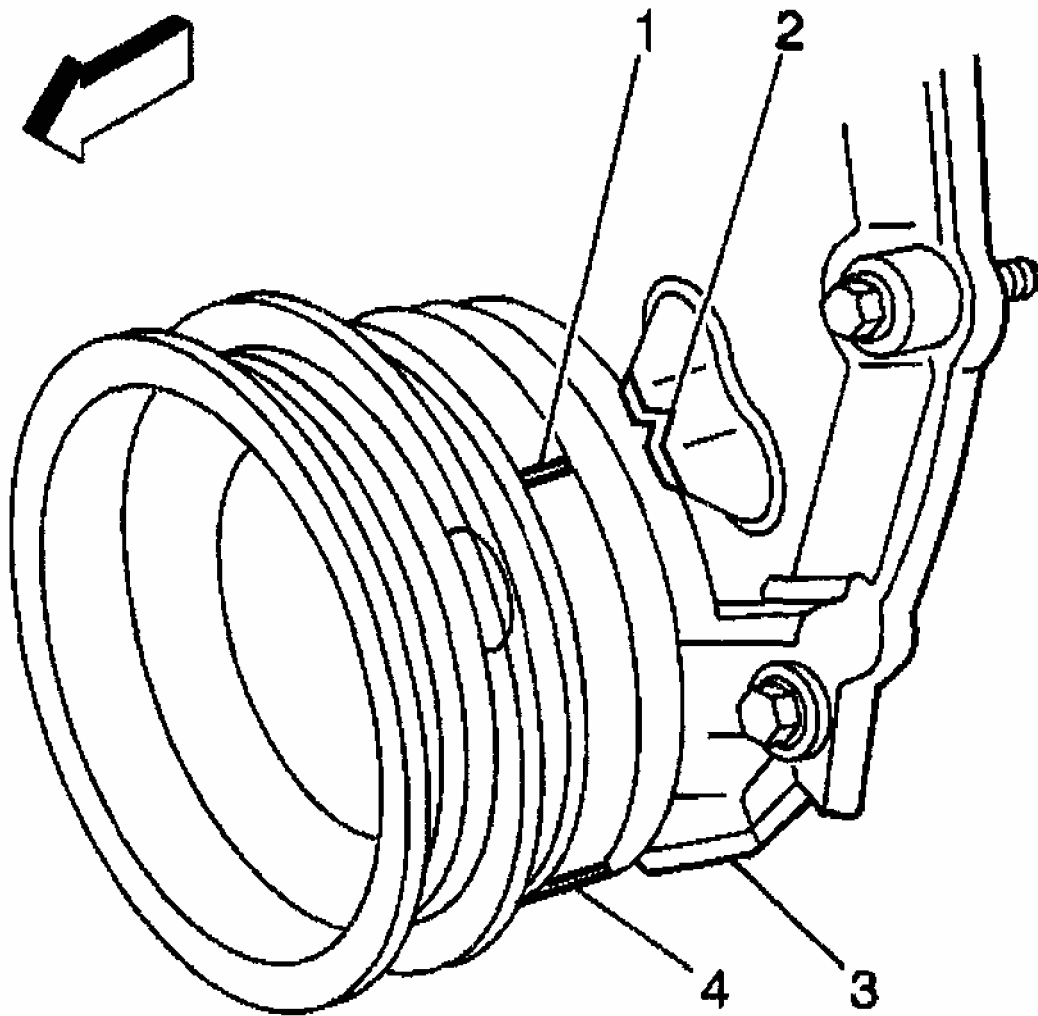


Fig. 363: EVAP Canister Solenoid Valve Harness
Courtesy of GENERAL MOTORS CORP.

DISTRIBUTOR INSTALLATION

Important: The engine front cover has 2 alignment tabs and the crankshaft balancer has 2 alignment marks (spaced 90 degrees apart) which are used for positioning number 1 piston at top dead center (TDC). With the piston on the compression stroke and at top dead center, the crankshaft balancer alignment mark (1) must align with the engine front cover tab (2) and the crankshaft balancer alignment mark (4) must align with the engine front cover tab (3).

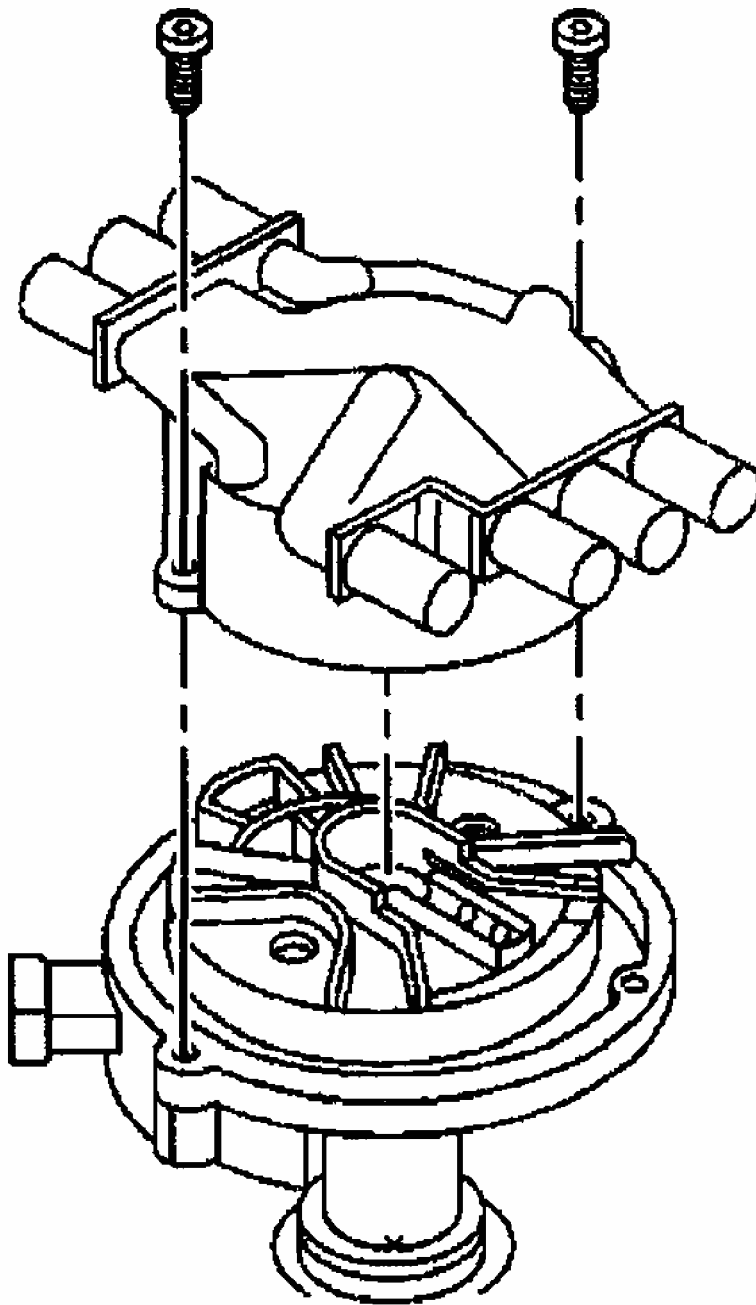
1. Rotate the crankshaft balancer clockwise until the alignment marks on the crankshaft balancer are aligned with the tabs on the engine front cover and the number 1 piston is at top dead center of the compression stroke.



G02503123

Fig. 364: Crankshaft Balancer Alignment Mark
Courtesy of GENERAL MOTORS CORP.

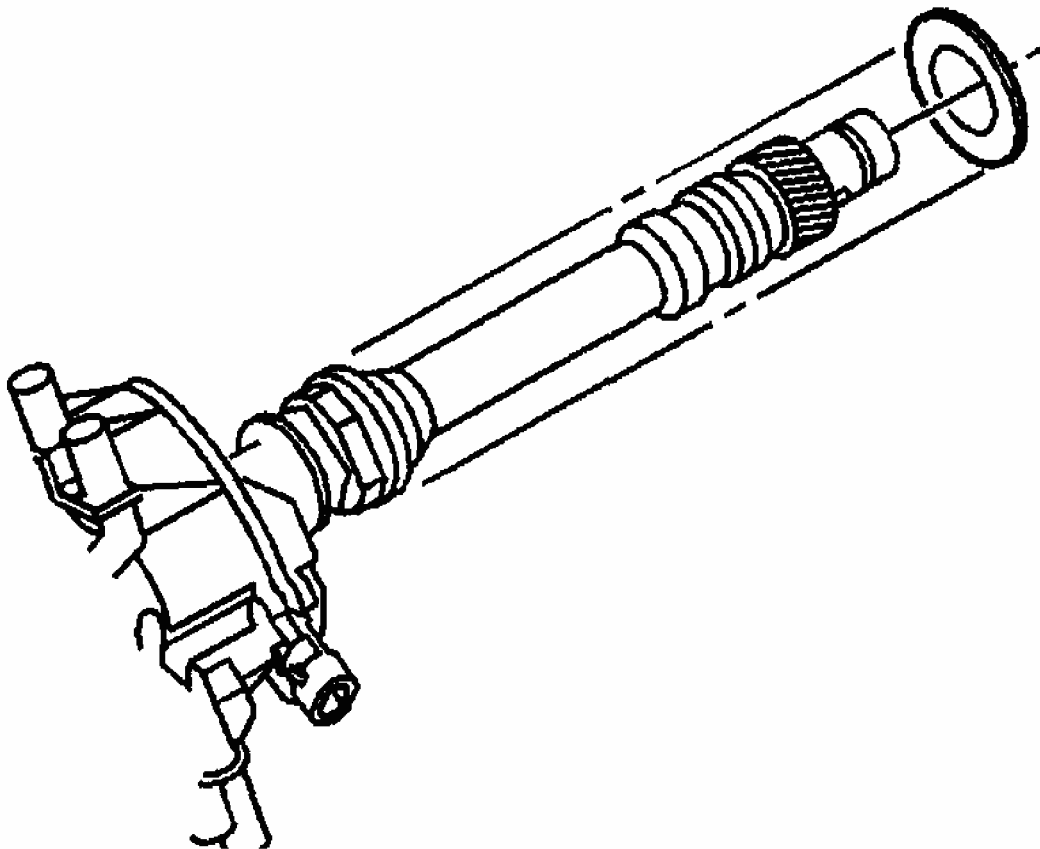
2. Remove the distributor cap bolts and discard.
3. Remove the distributor cap.



G02503124

Fig. 365: Distributor Cap
Courtesy of GENERAL MOTORS CORP.

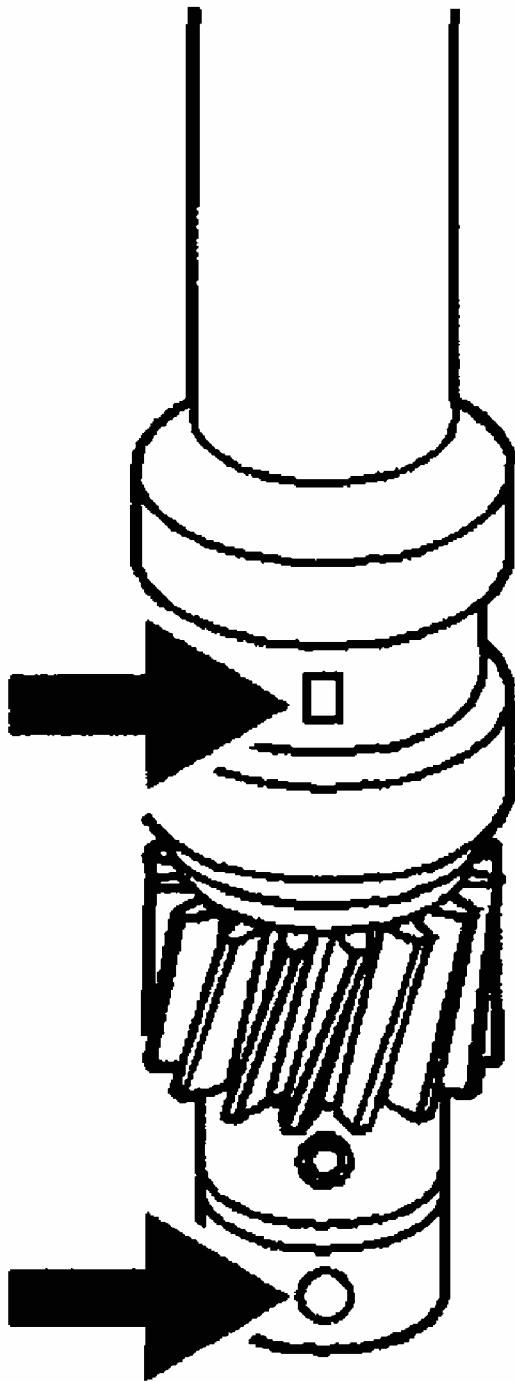
4. Install a NEW distributor gasket onto the distributor.



G02503125

Fig. 366: Distributor Gasket
Courtesy of GENERAL MOTORS CORP.

5. Align the indent hole on the driven gear with the paint mark on the distributor housing.



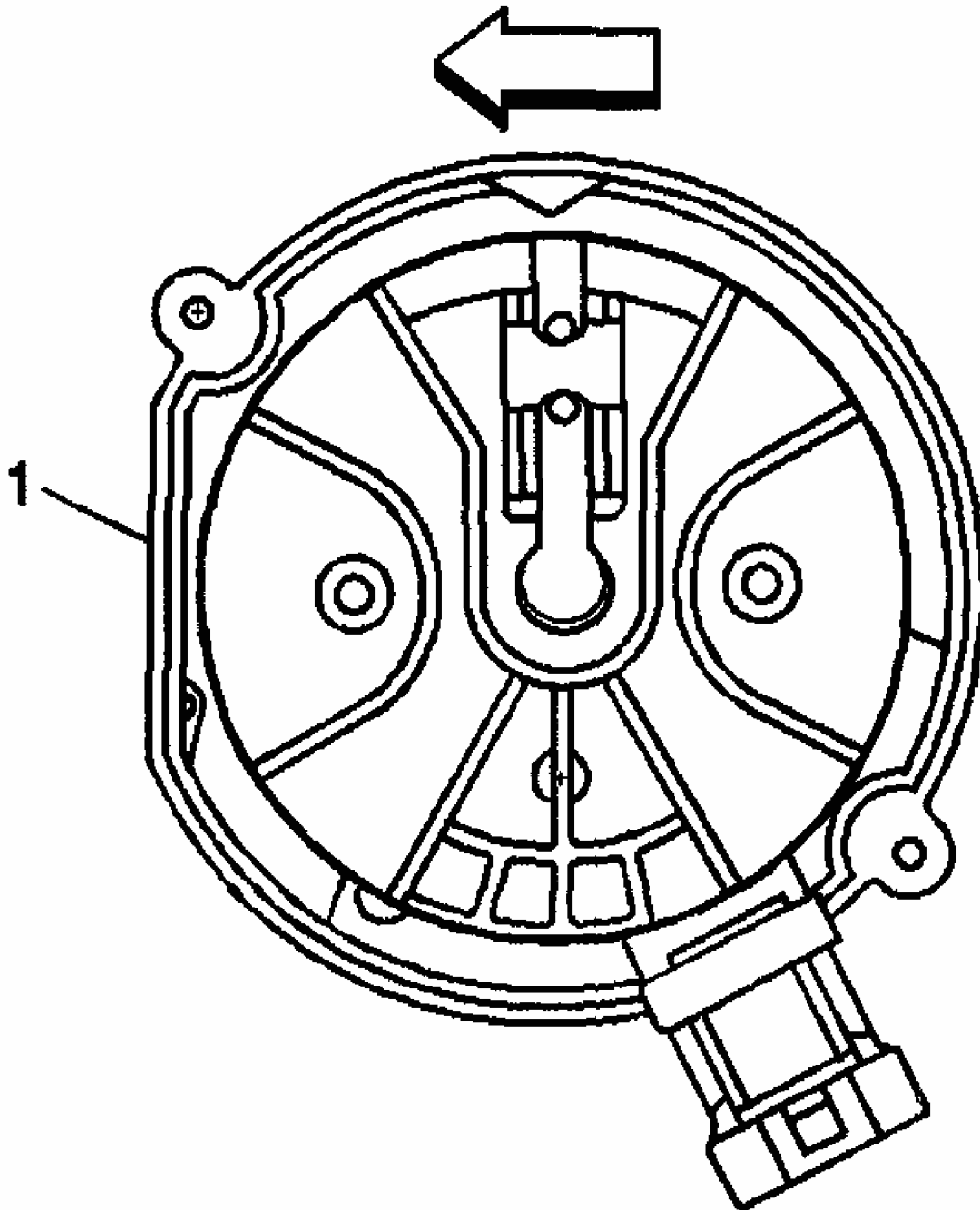
G02503126

Fig. 367: Aligning Indent Hole On Driven Gear With Paint Mark On Distributor Housing

Courtesy of GENERAL MOTORS CORP.

6. Ensure that the distributor rotor segment points to the cap hold area.
7. Align the slotted tang in the oil pump driveshaft with the distributor driveshaft. Rotate the oil pump driveshaft with a screwdriver if necessary.

8. Align the flat (1) in the distributor housing toward the front of the engine.



G02503127

Fig. 368: Aligning Flat In Distributor Housing Toward Front Of Engine
Courtesy of GENERAL MOTORS CORP.

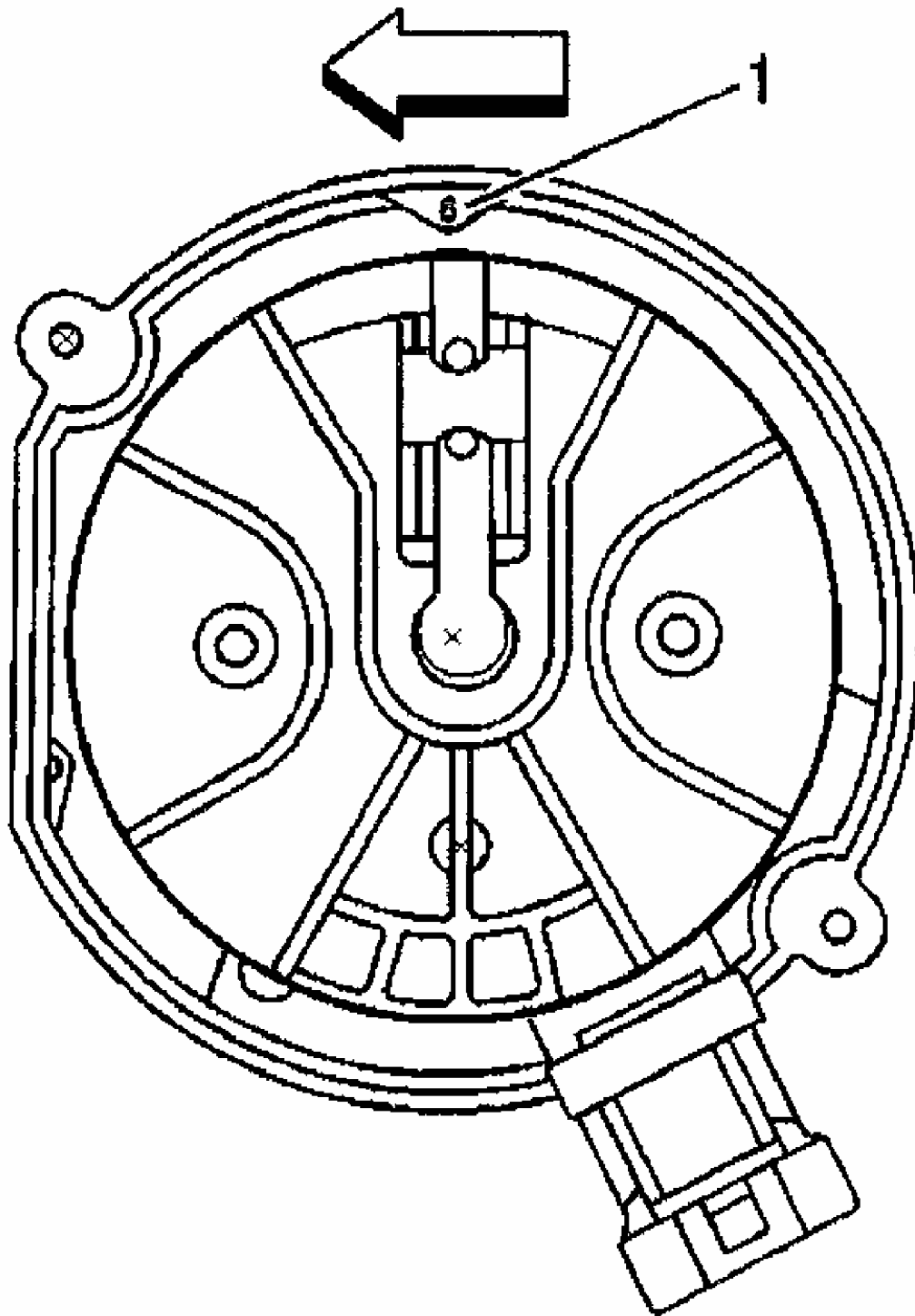
9. Install the distributor and distributor clamp. The flat in the distributor housing must

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

point toward the front of the engine.

10. Once the distributor is fully seated, align the distributor rotor segment with the number 6 pointer (1) that is cast into the distributor base. If the distributor rotor segment does not come within a few degrees of the number 6 pointer (1), the gear mesh between the distributor and camshaft may be off a tooth or more. Repeat the procedure again in order to achieve proper alignment.



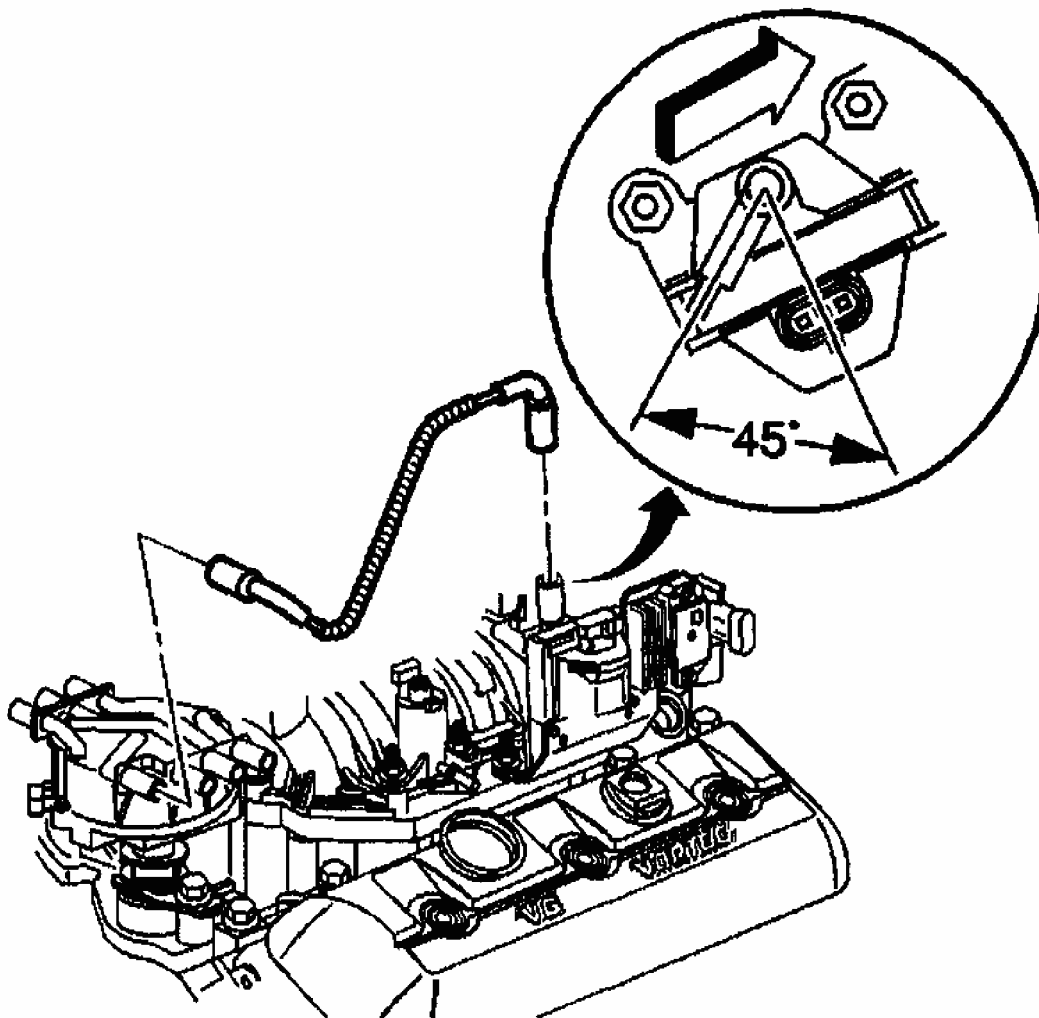
G02503129

Fig. 369: Aligning Distributor Rotor Segment With No. 6 Pointer On Distributor

Base

Courtesy of GENERAL MOTORS CORP.

11. Install the distributor clamp bolt. Tighten the distributor clamp bolt to 25 N.m (18 lb ft).
12. Install the distributor cap and NEW distributor cap bolts. Tighten the distributor cap bolts to 2.4 N.m (21 lb in).
13. Install the ignition coil wire harness.



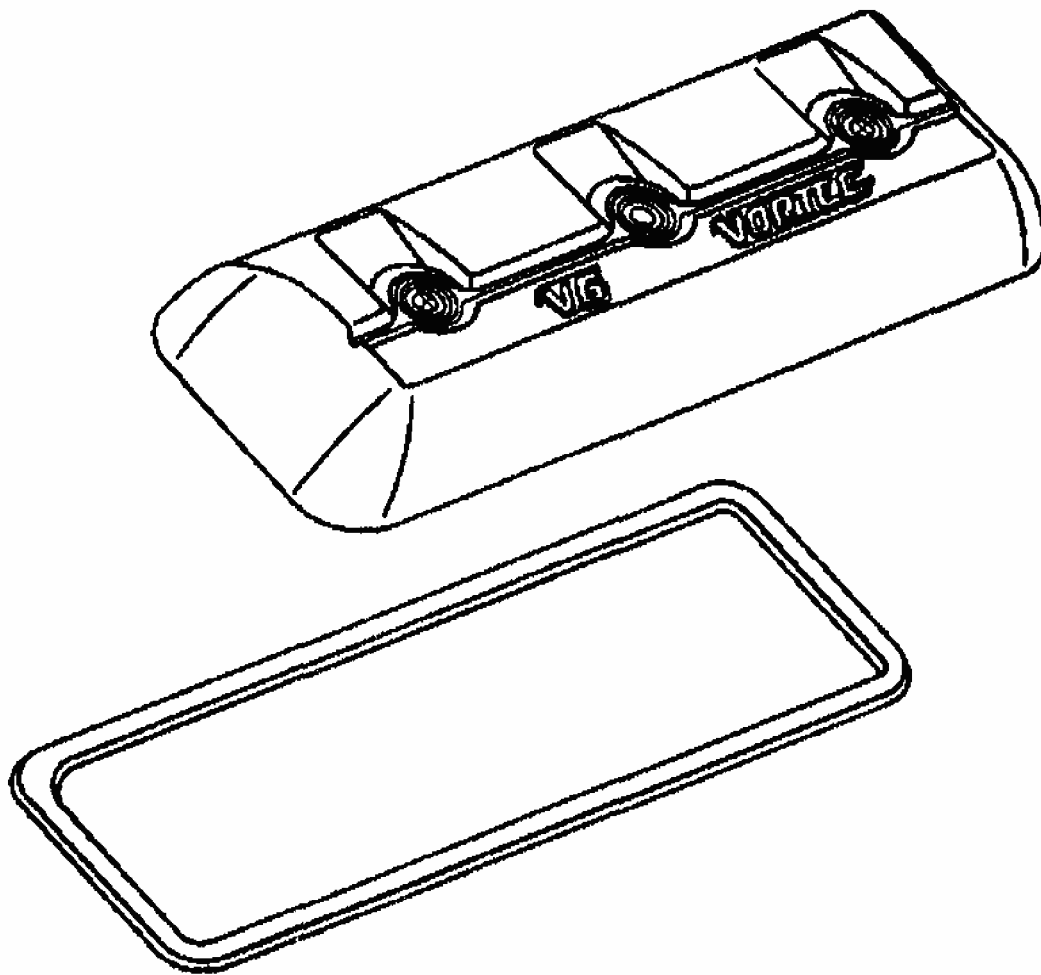
G02503132

Fig. 370: Ignition Coil Wire

Courtesy of GENERAL MOTORS CORP.

Important: Do not reuse the valve cover gasket or the valve rocker arm cover bolt grommets.

1. Install the NEW valve rocker arm cover gasket into the groove of the valve rocker arm cover.
2. Install the NEW valve rocker arm cover bolt grommets into the valve rocker arm cover.



G02503133

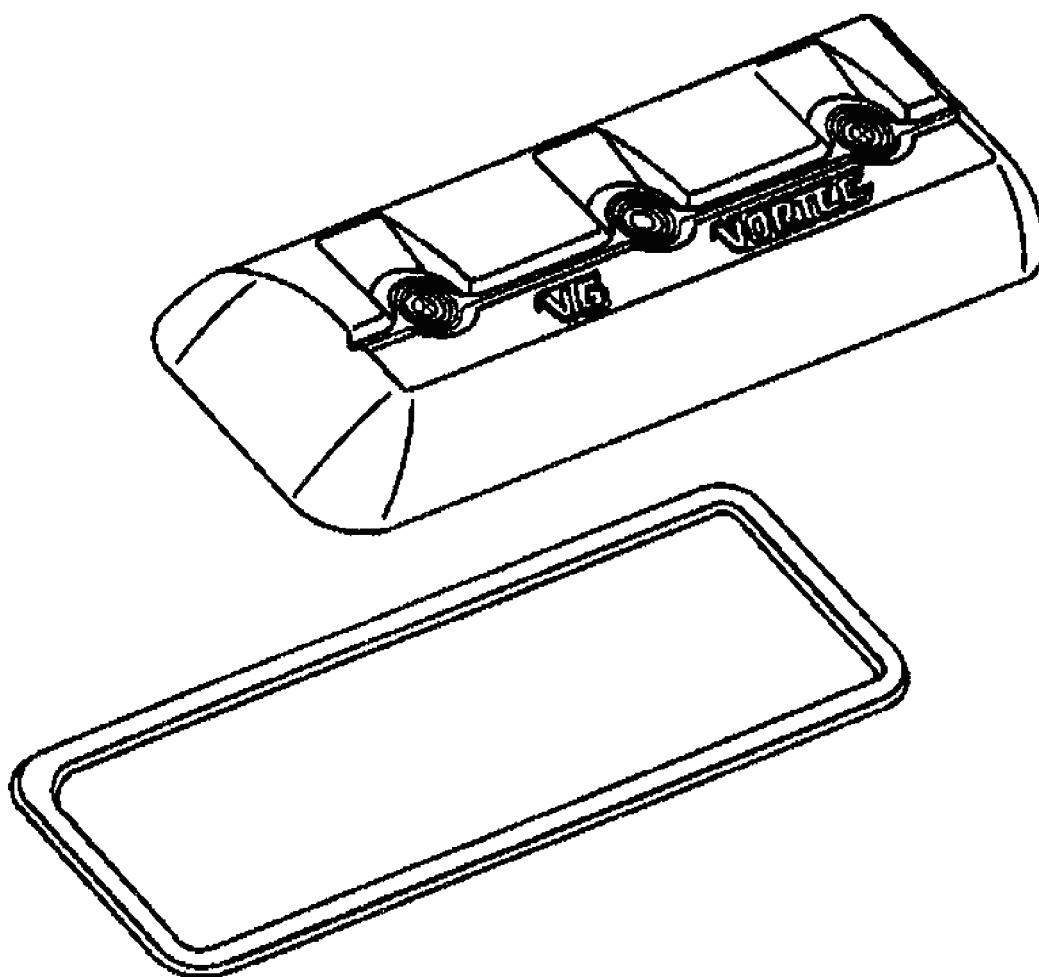
Fig. 371: Valve Rocker Arm Cover (Left Side)
Courtesy of GENERAL MOTORS CORP.

3. Install the valve rocker arm cover onto the cylinder head.
4. Install the valve rocker arm cover bolts. Tighten the valve rocker arm cover bolts to 12 N.m (106 lb in).

VALVE ROCKER ARM COVER INSTALLATION - RIGHT

Important: Do not reuse the valve cover gasket or the valve rocker arm cover bolt grommets.

1. Install the NEW valve rocker arm cover gasket into the groove of the valve rocker arm cover.
2. Install the NEW valve rocker arm cover bolt grommets into the valve rocker arm cover.



G02503136

Fig. 372: Valve Rocker Arm Cover (Right Side)
Courtesy of GENERAL MOTORS CORP.

3. Install the valve rocker arm cover onto the cylinder head.
4. Install the valve rocker arm cover bolts. Tighten the valve rocker arm cover bolts to 12 N.m (106 lb in).

1. Apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, around the oil level indicator tube 13 mm (0.5 in) below the tube bead.
2. Install the oil level indicator tube into the engine block. Rotate the oil level indicator tube into position.
3. Install the oil level indicator tube bolt. Tighten the oil level indicator tube bolt to 12 N.m (106 lb in).
4. Install the oil level indicator into the oil level indicator tube, if required.

WATER PUMP INSTALLATION

Tools Required

J 41240 Fan Clutch Remover and Installer

1. If reusing the fasteners, apply sealant GM P/N United States 12346004, GM P/N Canada 10953480, or equivalent, to the threads of the water pump bolts.
2. Install the water pump and the NEW water pump gaskets.
3. Install the water pump bolts. Tighten the water pump bolts to 45 N.m (33 Lb ft).

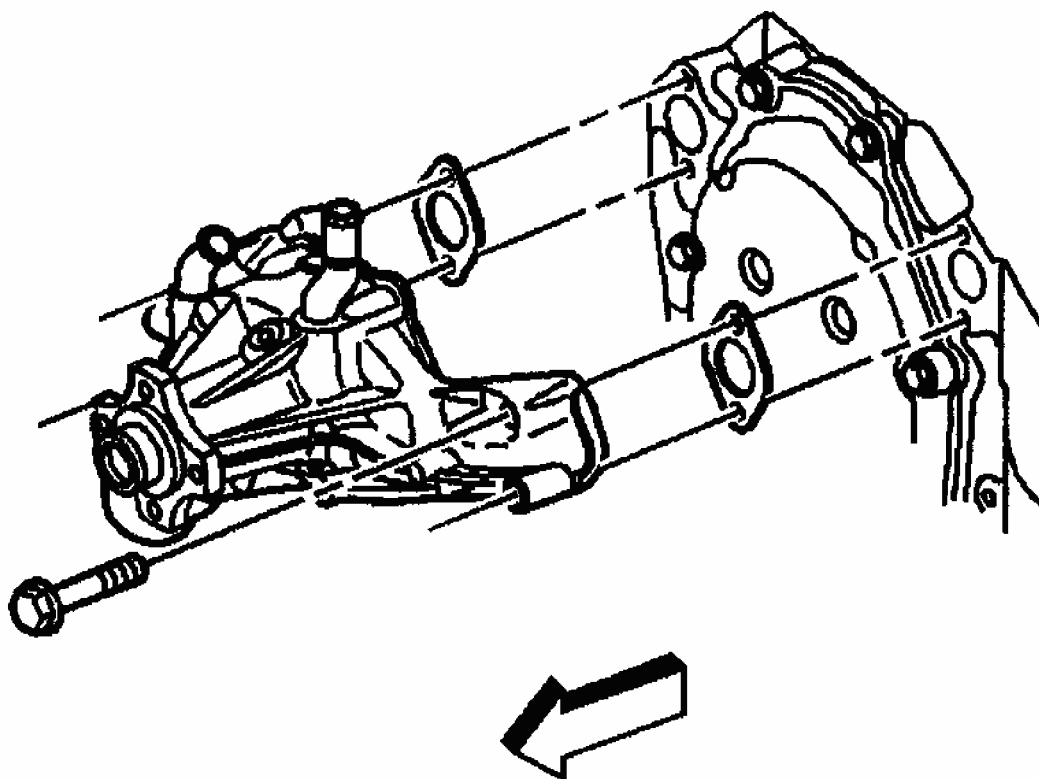
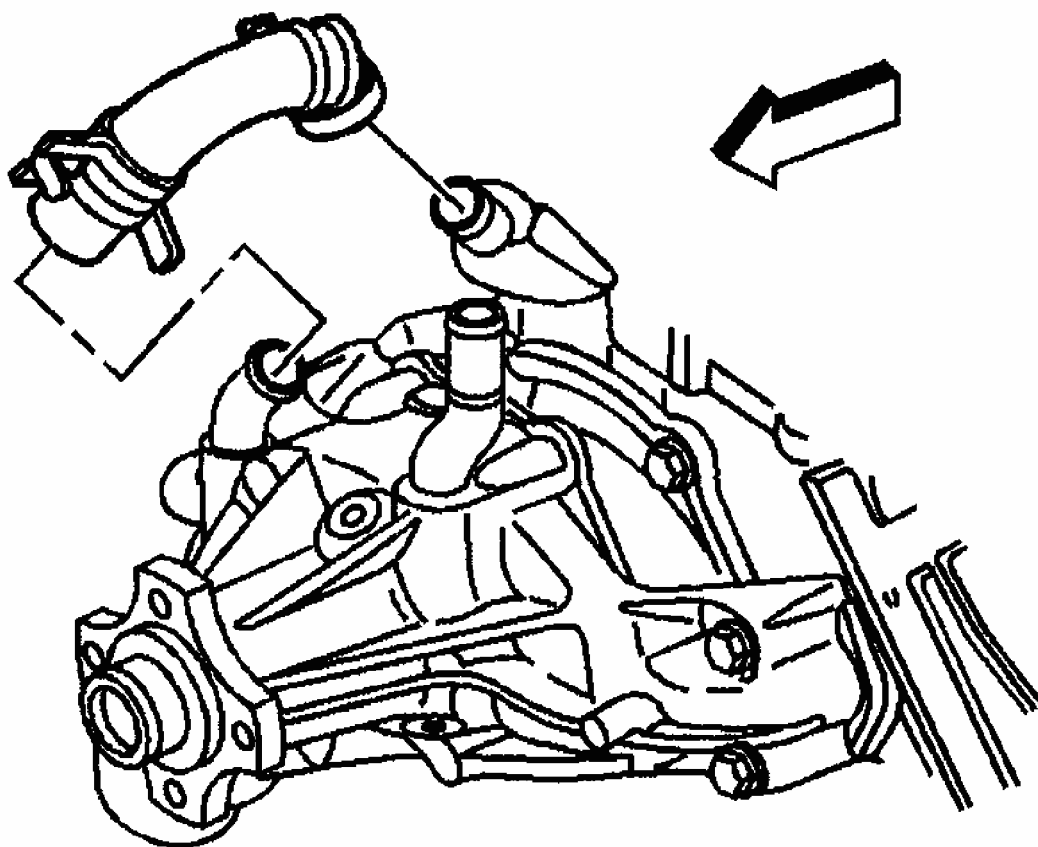


Fig. 373: Water Pump Assembly
Courtesy of GENERAL MOTORS CORP.

Important: After final assembly, the water pump inlet hose clamp tangs, water pump end, must point forward and the upper tang should be level with the outside diameter of the water pump inlet hose.

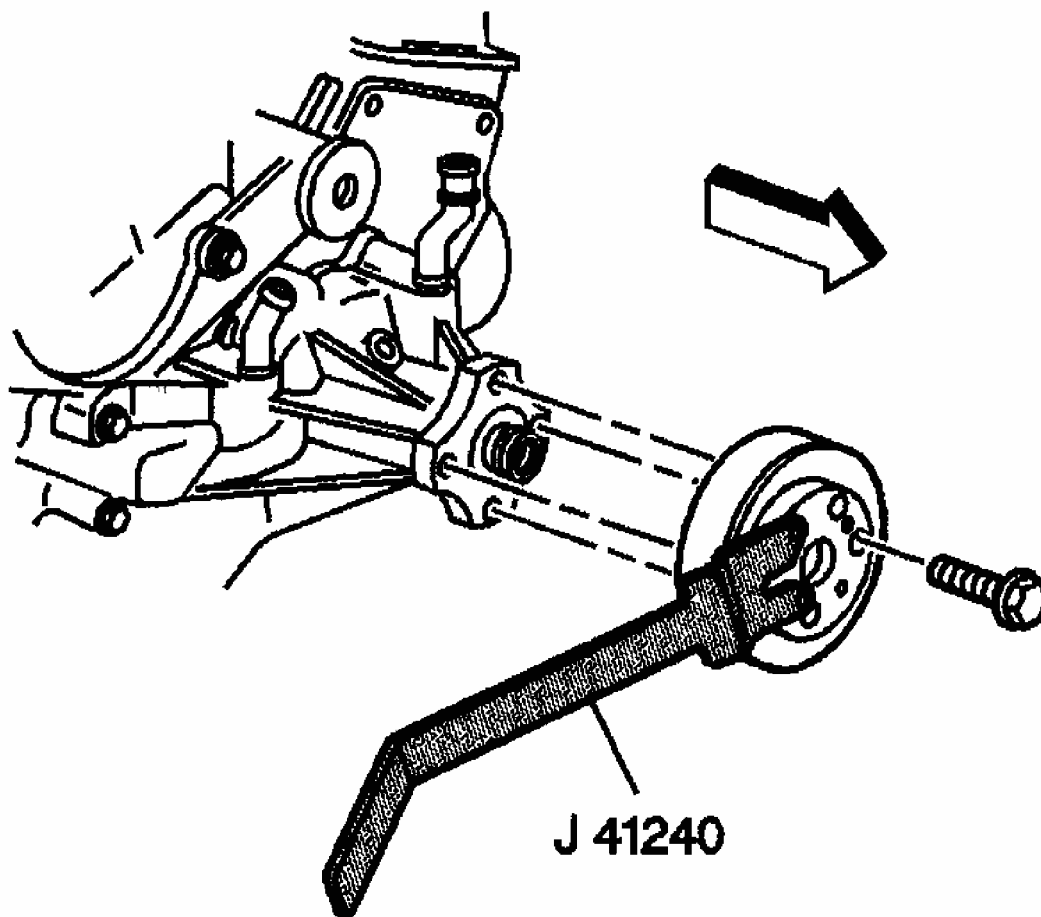
4. Install the water pump inlet hose and the water pump inlet hose clamps.



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Fig. 374: Water Pump Inlet Hose
Courtesy of GENERAL MOTORS CORP.

5. Install the fan and water pump pulley and bolts using the **J 41240** . Tighten the fan and water pump pulley bolts to 25 N.m (18 lb ft).

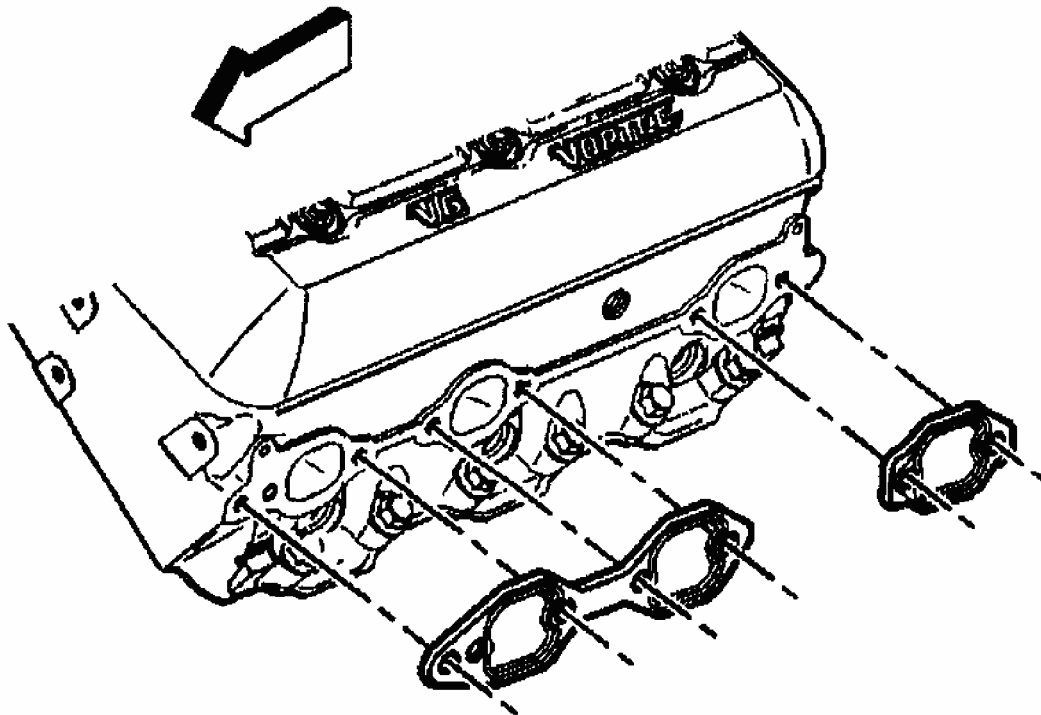


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Fig. 375: Installing Fan & Water Pump Pulley
Courtesy of GENERAL MOTORS CORP.

EXHAUST MANIFOLD INSTALLATION - LEFT

1. Install the NEW exhaust manifold gaskets.



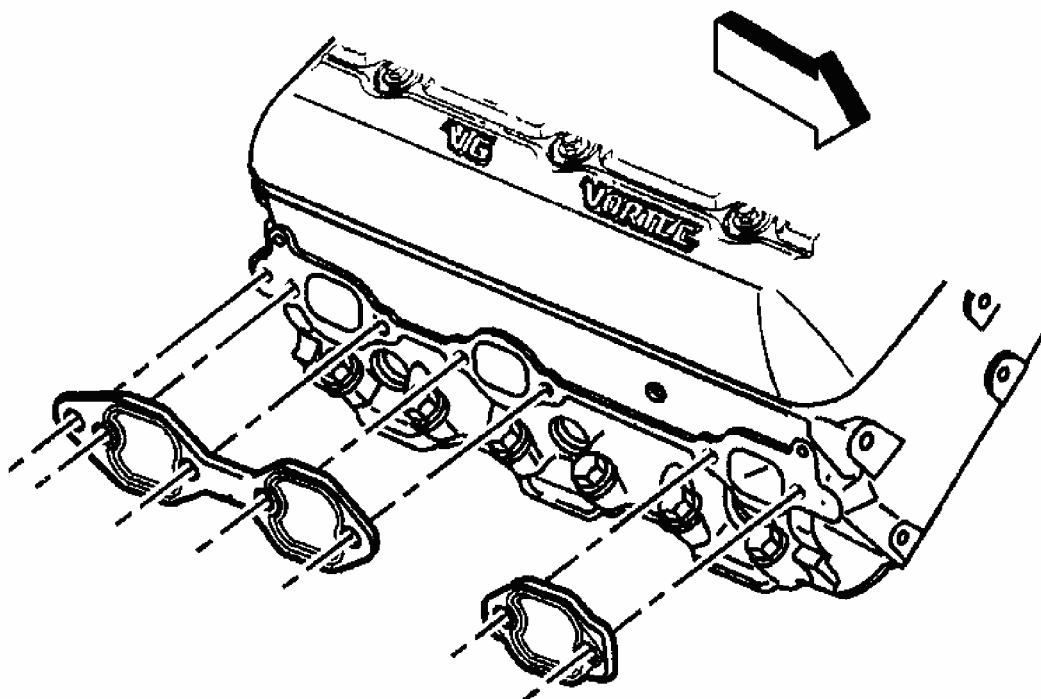
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Fig. 376: Exhaust Manifold Gaskets
Courtesy of GENERAL MOTORS CORP.

2. Install the exhaust manifold.
3. Install the spark plug wire shields.
4. If reusing the fasteners, apply threadlock GM P/N United States 12345493, GM P/N Canada 10953488, or equivalent, to the threads of the exhaust manifold bolts and stud.
5. Install the exhaust manifold bolts and stud.
 - 5.1. Tighten the exhaust manifold bolts and stud on the first pass to 15 N.m (11 Lb ft).
 - 5.2. Tighten the exhaust manifold bolts and stud on the final pass to 30 N.m (22 Lb ft).
6. Install the spark plug wires to the spark plug wire retainers.
7. Install the spark plug wires onto the spark plugs.

EXHAUST MANIFOLD INSTALLATION - RIGHT

1. Install the NEW exhaust manifold gaskets.



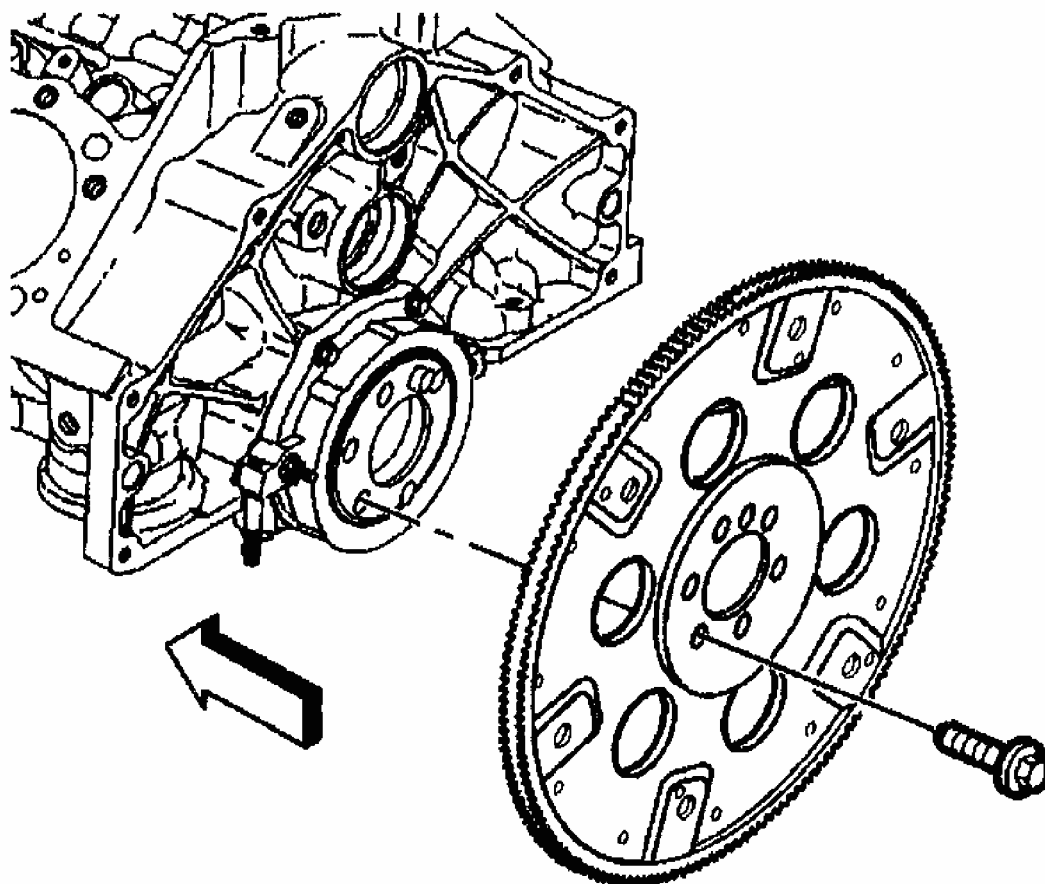
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Fig. 377: Exhaust Manifold Gaskets
Courtesy of GENERAL MOTORS CORP.

2. Install the exhaust manifold.
3. Install the spark plug wire shields.
4. If reusing the fasteners, apply threadlock GM P/N United States 12345493, GM P/N Canada 10953488, or equivalent, to the threads of the exhaust manifold bolts.
5. Install the exhaust manifold bolts.
 - 5.1. Tighten the exhaust manifold bolts on the first pass to 15 N.m (11 Lb ft).
 - 5.2. Tighten the exhaust manifold bolts on the final pass to 30 N.m (22 Lb ft).
6. Install the spark plug wires to the spark plug wire retainers.
7. Install the spark plug wires onto the spark plugs.

ENGINE FLYWHEEL INSTALLATION

1. Install the engine flywheel to the crankshaft.
2. Align the locator hole to the pin.



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Fig. 378: Engine Flywheel Locator Hole & Pin
Courtesy of GENERAL MOTORS CORP.

3. Install the engine flywheel bolts. Tighten the engine flywheel bolts in sequence to 100 N.m (74 lb ft).

DESCRIPTION & OPERATION

ENGINE COMPONENT DESCRIPTION

Balance Shaft

The cast iron balance shaft is mounted in the crankcase above and in-line with the camshaft. A camshaft gear drives the gear attached to the balance shaft. The front end of the balance shaft is supported by a ball-type bearing. The rear end of the balance shaft uses a sleeve-type bearing.

Camshaft

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The steel camshaft is supported by four bearings pressed into the engine block. The camshaft timing chain sprocket mounted to the front of the camshaft is driven by the crankshaft sprocket through a camshaft timing chain.

Crankshaft

The cast nodular iron crankshaft is supported by four crankshaft bearings. The number four crankshaft bearing at the rear of the engine is the end thrust bearing. The crankshaft bearings are retained by bearing caps that are machined with the engine block for proper alignment and clearances. The crankshaft position sensor reluctor ring has three lugs used for crankshaft timing and is constructed of powdered metal. The crankshaft position sensor reluctor ring has a slight interference fit onto the crankshaft and an internal keyway for correct positioning.

Cylinder Heads

The cast iron cylinder heads have one intake and one exhaust valve for each cylinder. A spark plug is located between the valves in the side of the cylinder head. The valve guides and seats are integral to the cylinder head. The 4.3L heavy duty applications have pressed in exhaust valve seats. The valve rocker arms are positioned on the valve rocker arm supports and retained by a bolt.

Engine Block

The cast iron engine block has six cylinders arranged in a V shape with three cylinders in each bank. Starting at the front side of the engine block, the cylinders in the left bank are numbered 1-3-5 and cylinders in the right bank are numbered 2-4-6 (when viewed from the rear). The firing order of the cylinders is 1-6-5-4-3-2. The cylinders are encircled by coolant jackets.

Exhaust Manifolds

The cast iron exhaust manifolds direct exhaust gases from the combustion chambers to the exhaust system. The left side exhaust manifold has a port for the EGR valve inlet pipe.

Intake Manifold

The intake manifold is a two-piece design. The upper portion is made from a composite material and the lower portion is cast aluminum. The throttle body attaches to the upper manifold. The lower manifold has an exhaust gas recirculation (EGR) port cast into the manifold for mixture. The (EGR) valve bolts into the lower intake manifold. The Central Sequential Multiport Fuel Injection system uses multiple fuel injectors to meter and distribute fuel to each engine cylinder. The Central (SFI) is retained by a bracket bolted to the lower intake manifold. The fuel meter body also houses the pressure regulator. Metal inlet and outlet fuel lines and nylon delivery tubes connect to the Central (SFI) unit. The delivery tubes independently distribute fuel to each cylinder through nozzles located at the

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port entrance of each manifold runner where the fuel is atomized.

Piston and Connecting Rod Assemblies

The cast aluminum pistons use two compression rings and one oil control assembly. The piston is a low friction, lightweight design with a flat top and barrel shaped skirt. The piston pins are offset 0.9 mm (0.354 in) toward the major thrust side (right side) to reduce piston slap as the connecting rod travels from one side of the piston to the other side after a stroke. The piston pins have a floating fit in the piston and are retained by a press fit in the connecting rod. The connecting rods are forged steel. The connecting rods are machined with the rod cap installed for proper clearances and alignments.

Valve Train

Motion is transmitted from the camshaft through the hydraulic roller valve lifters and the tubular valve pushrods to the roller type valve rocker arms. The roller type valve rocker arm pivots on a needle type bearing in order to open the valve. The valve rocker arms for each bank of cylinders are mounted to a one piece valve rocker arm support. Each valve rocker arm is retained on the valve rocker arm support and the cylinder head by a bolt. The hydraulic valve lifters keep all the parts of the valve train in constant contact. Each hydraulic valve lifter acts as an automatic adjuster and maintains zero lash in the valve train. This eliminates the need for periodic valve adjustment.

NEW PRODUCT INFORMATION

The purpose of New Product Information is to highlight or indicate important product changes from the previous model year.

Changes may include one or more of the following items:

- A component comparison from the previous year
- Fastener changes
- Torque values and/or fastener tightening strategies
- Changed engine specifications
- New sealants and/or adhesives
- Disassembly and assembly procedure revisions
- Engine mechanical diagnostic procedure revisions
- New special tools required

Component Comparison

- Revised the water pump seal
- Revised the engine coolant thermostat
- New roller pivot type valve rocker arm assemblies using a one piece valve rocker arm

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support to replace the ball pivot type valve rocker arm system

- Cylinder heads revised using dry holes for the valve rocker arm bolts

Torque Values And/Or Fastener Tightening Strategies

- Cylinder head bolts, the crankshaft bearing cap bolts, the connecting rod bolts, and balance shaft bolt apply a torque angle strategy.

In an on-vehicle situation where a torque angle meter may not fit into the vehicle packaging, a three step tightening process may be followed using a torque wrench.

- Certain fasteners should not be reused. Bolts, studs, or other fasteners that must be replaced will be called out in the specific service procedure.

Changed Engine Specifications

Engine mechanical specifications remain the same as the 1999 products.

New Sealants and/or Adhesives

No new sealants or adhesive have been added.

Disassembly and Assembly Procedure Revisions

- Valve rocker arm and push rod
- Timing chain and sprockets
- Discard all used gaskets, seals, or O-ring seals unless otherwise indicated.

Gaskets, seals, or O-ring seals that can be reused will be identified in the specific service procedure.

Engine Mechanical Diagnostic Procedure Revisions

- Valve Train diagnostic information is now provided in table form.

Potential or probable causes are supplied for each specific concern.

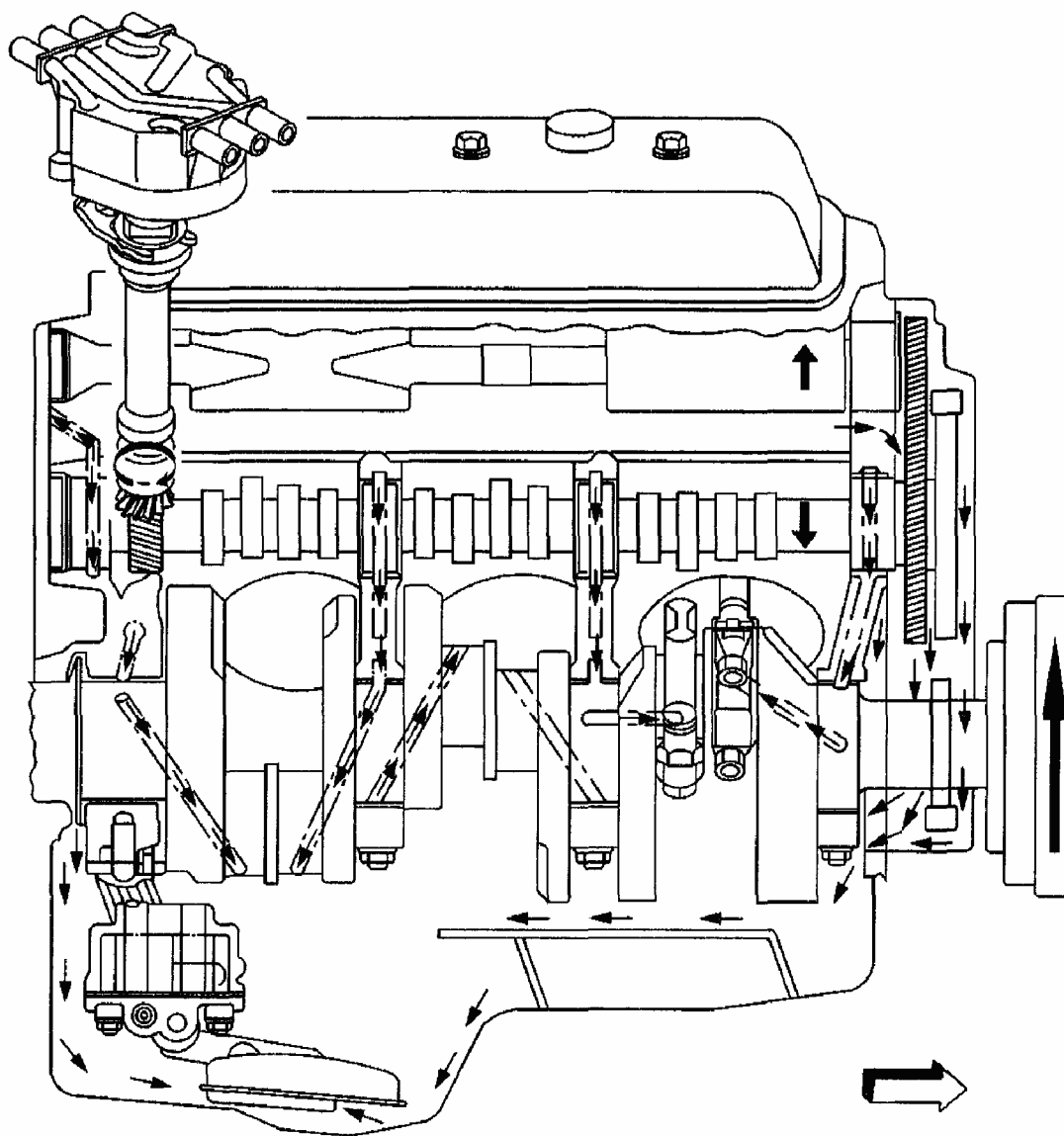
- Engine Noise diagnostic information is now provided in table form.

Potential or probable causes are supplied for each specific concern.

New Special Tools Required

No new special tools are required.

LUBRICATION DESCRIPTION



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Fig. 379: Engine Lubrication Flow
Courtesy of GENERAL MOTORS CORP.

Full pressure lubrication, through a full-flow oil filter is supplied by a gear-type oil pump. Oil is drawn up through the oil pump screen and passes through the pump to the oil filter. The oil filter is a full-flow paper element unit with an anti-drain back valve. An oil filter bypass valve is used to ensure adequate oil supply, in the event the filter becomes plugged or develops excessive pressure drop. Filtered oil flows into the main gallery and then to the camshaft, the balance shaft, the rear bearing, and the crankshaft bearings. The valve lifter oil gallery supplies oil to the valve lifters. Oil flows from the valve lifters through the hollow valve pushrods to the valve rocker arms. Oil drains back to the crankcase through the oil drain holes in the cylinder head. The camshaft timing chain is drip fed from the front camshaft bearing. The pistons and piston pins are lubricated by oil splash.

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CLEANLINESS & CARE

- Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.
- When any internal engine parts are serviced, care and cleanliness is important.
- When components are removed for service, the components should be marked, organized or retained in a specific order for re-assembly.
- At the time of installation, the components should be installed in the same location and with the same mating surface as when removed.
- An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in millimeters or thousandths of an inch. The surfaces should be protected to avoid component damage.
- Apply a liberal amount of clean engine oil to friction areas during assembly.
- Proper lubrication will protect and lubricate friction areas during initial operation.

REPLACING ENGINE GASKETS

Gasket Reuse and Applying Sealant

- Do not reuse any gasket unless specified.
- Gaskets that can be reused will be identified in the service procedure.
- Do not apply sealant to any gasket or sealing surface unless specified in the service procedure.

Separating Components

- Use a rubber mallet in order to separate the components.
- Bump the part sideways in order to loosen the components.
- Bumping of the component should be done at bends or reinforced areas of the component to prevent distortion of the components.

Cleaning Gasket Surfaces

- Use care to avoid gouging or scraping the sealing surfaces.
- Use a plastic or wood scraper in order to remove all the sealant from the components.

Do not use any other method or technique to remove the sealant or the gasket material from a part.

- Do not use abrasive pads, sand paper, or power tools to clean the gasket surfaces.
 - These methods of cleaning can cause damage to the component sealing surfaces.
 - Abrasive pads also produce a fine grit that the oil filter cannot remove from the

engine oil.

This fine grit is an abrasive and can cause internal engine damage.

Assembling Components

- Assemble components using only the sealant (or equivalent) that is specified in the service procedure.
- Sealing surfaces must be clean and free of debris or oil.
- Specific components such as crankshaft oil seals or valve stem oil seals may require lubrication during assembly.
- Components requiring lubrication will be identified in the service procedure.
- Apply only the amount of sealant specified in the service procedure to a component.
- Do not allow the sealant to enter into any blind threaded holes, as the sealant may prevent the fastener from clamping properly or cause component damage when tightened.

Important: Do not overtighten the fasteners.

- Tighten the fasteners to the proper specifications.

USE OF RTV & ANAEROBIC SEALER

Sealant Types

Important: The correct sealant and amount of sealant must be used in the proper location to prevent oil leaks, coolant leaks, or the loosening of the fasteners. DO NOT interchange the sealants. Use only the sealant, or equivalent, as specified in the service procedure.

The following 2 major types of sealant are commonly used in engines:

- Aerobic sealant Room Temperature Vulcanizing (RTV)
- Anaerobic sealant, which include the following:
 - Gasket eliminator
 - Pipe

Aerobic Type Room Temperature Vulcanizing (RTV) Sealant

Aerobic type Room Temperature Vulcanizing (RTV) sealant cures when exposed to air. This type of sealant is used where 2 components, such as the intake manifold and the engine block, are assembled together.

Use the following information when using RTV sealant:

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- Do not use RTV sealant in areas where extreme temperatures are expected. These areas include:
 - The exhaust manifold
 - The head gasket
 - Any other surfaces where a different type of sealant is specified in the service procedure
- Always follow all the safety recommendations and the directions that are on the RTV sealant container.
- Use a plastic or wood scraper in order to remove all the RTV sealant from the components.

NOTE: Do not allow the RTV sealant to enter any blind threaded hole. RTV sealant that is allowed to enter a blind threaded hole can cause hydraulic lock of the fastener when the fastener is tightened. Hydraulic lock of a fastener can lead to damage to the fastener and/or the components. Hydraulic lock of a fastener can also prevent the proper clamping loads to be obtained when the fastener is tightened. Improper clamping loads can prevent proper sealing of the components allowing leakage to occur. Preventing proper fastener tightening can allow the components to loosen or separate leading to extensive engine damage.

- The surfaces to be sealed must be clean and dry.
- Use a RTV sealant bead size as specified in the service procedure.
- Apply the RTV sealant bead to the inside of any bolt holes areas.

Important: Do not wait for the RTV sealant to skin over.

- Assemble the components while the RTV sealant is still wet to the touch, within 3 minutes.

Important: Do not overtighten the fasteners.

- Tighten the fasteners in sequence, if specified, and to the proper torque specifications.

Anaerobic Type Gasket Eliminator Sealant

Anaerobic type gasket eliminator sealant cures in the absence of air. This type of sealant is used where 2 rigid parts, such as castings, are assembled together. When 2 rigid parts are disassembled and no sealant or gasket is readily noticeable, then the 2 parts were probably assembled using an anaerobic type gasket eliminator sealant.

Use the following information when using gasket eliminator sealant:

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- Always follow all the safety recommendations and directions that are on the gasket eliminator sealant container.
- Apply a continuous bead of gasket eliminator sealant to one flange.

The surfaces to be sealed must be clean and dry.

NOTE: **Do not allow the sealant to enter a blind hole. The sealant may prevent the fastener from achieving proper clamp load, cause component damage when the fastener is tightened, or lead to component failure.**

Important:

- Gasket eliminator sealed joint fasteners that are partially torqued and the gasket eliminator sealant allowed to cure more than five minutes, may result in incorrect shimming and sealing of the joint.
- Do not overtighten the fasteners.
 - Apply the gasket eliminator sealant evenly to get a uniform thickness of the gasket eliminator sealant on the sealing surface.
 - Tighten the fasteners in sequence, if specified, and to the proper torque specifications.
 - After properly tightening the fasteners, remove the excess gasket eliminator sealant from the outside of the joint.

Anaerobic Type Threadlock Sealant

Anaerobic type threadlock sealant cures in the absence of air. This type of sealant is used for threadlocking and sealing of bolts, fittings, nuts, and studs. This type of sealant cures only when confined between 2 close fitting metal surfaces.

Use the following information when using threadlock sealant:

- Always follow all safety recommendations and directions that are on the threadlock sealant container.
- The threaded surfaces to be sealed must be clean and dry.
- Apply the threadlock sealant as specified on the threadlock sealant container.

Important:

- Fasteners that are partially torqued and then the threadlock sealant allowed to cure more than five minutes, may result in incorrect clamp load of assembled components.
- Do not overtighten the fasteners.
- Tighten the fasteners in sequence, if specified, and to the proper torque specifications.

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Anaerobic Type Pipe Sealant

Anaerobic type pipe sealant cures in the absence of air and remains pliable when cured. This type of sealant is used where 2 parts are assembled together and require a leak proof joint.

Use the following information when using pipe sealant:

- Do not use pipe sealant in areas where extreme temperatures are expected. These areas include:
 - The exhaust manifold
 - The head gasket
 - Surfaces where a different sealant is specified
- Always follow all the safety recommendations and the directions that are on the pipe sealant container.
- The surfaces to be sealed must be clean and dry.
- Use a pipe sealant bead of the size or quantity as specified in the service procedure.

NOTE: Do not allow the sealant to enter a blind hole. The sealant may prevent the fastener from achieving proper clamp load, cause component damage when the fastener is tightened, or lead to component failure.

- Apply the pipe sealant bead to the inside of any bolt hole areas.
- Apply a continuous bead of pipe sealant to 1 sealing surface.

Important: Do not overtighten the fasteners.

- Tighten the fasteners in sequence, if specified, and to the proper torque specifications.

SEPARATING PARTS

Important: Many internal engine components will develop specific wear patterns on their friction surfaces.

When disassembling the engine, internal components **MUST** be separated, marked and organized in a way to ensure reinstallation to original location and position.

Mark or identify the following components:

- Piston and the piston pin
- Piston to the specific cylinder bore
- Piston rings to the specific cylinder bore
- Connecting rod to the crankshaft journal

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- Connecting rod to connecting rod cap
- Crankshaft bearings and connecting rod bearings
- Engine camshaft and valve lifters
- Valve lifters, valve rocker arms, and valve rocker arm supports
- Valve to the valve guide
- Valve spring to cylinder head location
- Engine block bearing cap location and direction
- Oil pump drive and driven gears

TOOLS & EQUIPMENT

Special tools are listed and illustrated throughout this section with a complete listing at the end of the section. The tools (or the equivalents) are specially designed to quickly and safely accomplish the operations for which the tools are intended. The use of special tools will also minimize possible damage to engine components. Some precision measuring tools are required for inspection of certain critical components. Torque wrenches and a torque angle meter are necessary for the proper tightening of various fasteners.

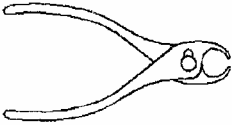
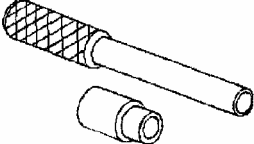
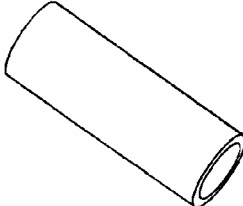
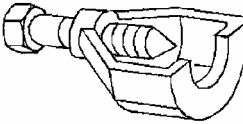
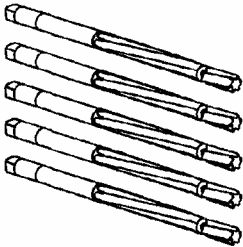
To properly service the engine assembly, the following items should be readily available:

- Approved eye protection and safety gloves
- A clean, well-lit, work area
- A suitable parts cleaning tank
- A compressed air supply
- Trays or storage containers to keep parts and fasteners organized
- An adequate set of hand tools
- Approved engine repair stand

SPECIAL TOOLS & EQUIPMENT

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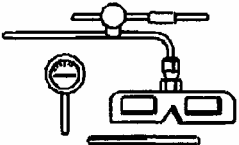
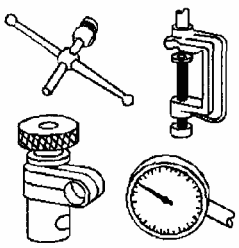
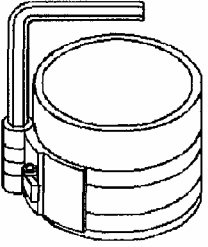
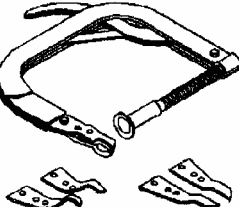
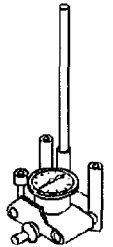
Illustration	Tool Number/ Description
	J 3049-A Valve Lifter Remover
	J 5239 Connecting Rod Bolt Guide Set
	J 5590 Pinion Bearing Race Installer - Rear
	J 5825-A Crankshaft Gear Remover
	J 5830-02 Valve Guide Reamer Set

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Fig. 380: Special Tools & Equipment (1 Of 6)
Courtesy of GENERAL MOTORS CORP.

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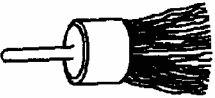
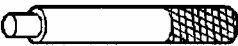
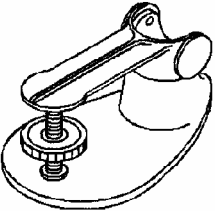

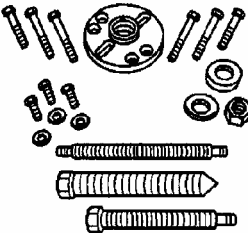
Illustration	Tool Number/ Description
	J 7872 Magnetic Base Dial Indicator
	J 8001 Dial Indicator Set
	J 8037 Ring Compressor
	J 8062 Valve Spring Compressor
	J 8087 Cylinder Bore Gage

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Fig. 381: Special Tools & Equipment (2 Of 6)
Courtesy of GENERAL MOTORS CORP.

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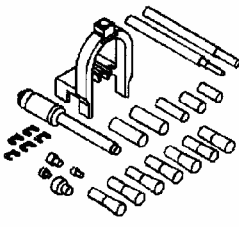
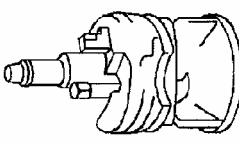
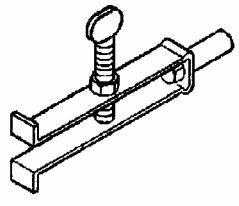
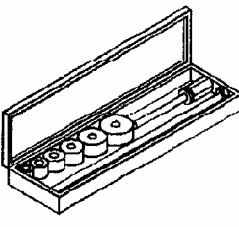
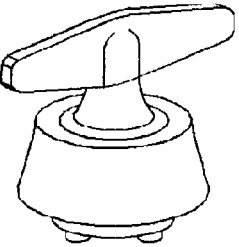
Illustration	Tool Number/ Description
	J 8089 Carbon Removing Brush
	J 8092 Universal Driver Handle
	J 9666 Valve Spring Tester
	J 21882 Oil Suction Pipe Installer
	J 23523-F Balancer Remover and Installer

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Fig. 382: Special Tools & Equipment (3 Of 6)
Courtesy of GENERAL MOTORS CORP.

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2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

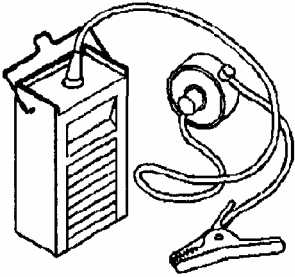
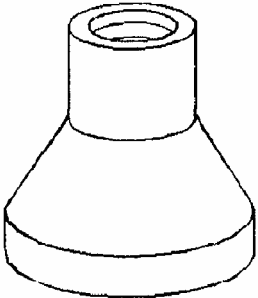
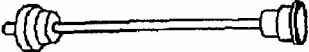
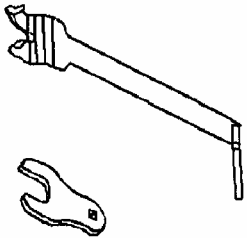
Illustration	Tool Number/ Description
	J 24086-C Piston Pin Remover/Installer
	J 24270 Cylinder Bore Ridge Reamer
	J 26941 Bushing/Bearing Remover
	J 33049 Camshaft Bearing Service Kit
	J 35621-B Rear Main Seal Installer

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Fig. 383: Special Tools & Equipment (4 Of 6)
Courtesy of GENERAL MOTORS CORP.

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

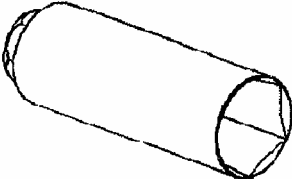
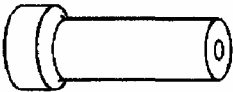
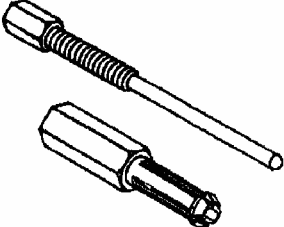
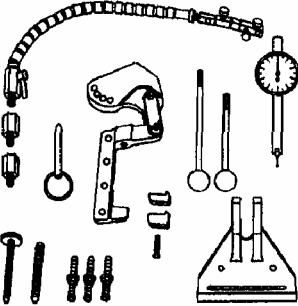
Illustration	Tool Number/ Description
	J 36660-A Electronic Torque Angle Meter
	J 36996 Balance Shaft Installer
	J 38834 Balance Shaft Service Kit
	J 41240 Fan Clutch Remover and Installer

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Fig. 384: Special Tools & Equipment (5 Of 6)
Courtesy of GENERAL MOTORS CORP.

2001 Chevrolet S10 Pickup

2000-01 ENGINES Engine Mechanical - 4.3L Unit Repair (Overhaul)

Illustration	Tool Number/ Description
	J 41712 Oil Pressure Switch Socket
	J 42073 Valve Stem Seal Installer
	J 43276 Clutch Pilot Bearing Remover
	J 43690 Rod Bearing Clearance Checking Tool

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Fig. 385: Special Tools & Equipment (6 Of 6)
Courtesy of GENERAL MOTORS CORP.